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BRIEF COMMUNICATION

Psychometric analysis of the Swedish translation of the WHO well-being index

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Abstract
Purpose The purpose of this study is to validate the Swedish translation of the WHO (Ten) and WHO (Five) Well-Being Questionnaires among three samples of Swedes.
Methods Baseline data collected in 2008 from the Health Assets Project are the data source consisting of three cohorts of Swedes aged 19–64 years: (1) a randomized general population cohort ($n = 4{,}027$); (2) employees sick-listed reported by the employer ($n = 3{,}310$); and (3) self-certified sick-listed individuals ($n = 498$). The psychometric properties of the scales are assessed using factor analysis, Cronbach's alpha, and examination of the relationship between scale scores and participants' self-reported adverse health conditions.
Results Factor analysis revealed a unidimensional factor structure for both scales, and Cronbach's alphas are very good to excellent. The scales correlate in the expected direction with almost all of the adverse health conditions considered.
Conclusions The Swedish translation of the WHO (Ten) and WHO (Five) Well-Being Questionnaires is psychometrically sound, but the first item of both scales has weaker psychometric qualities in comparison with other scale items.

Keywords Subjective well-being · WHO · Depression · Mental health · Validation · Psychometrics · Sick leave · Instrument · Questionnaire · Positive well-being

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Abbreviations

SWB	Subjective well-being
WHO	World health organization
WHO-B	WHO (Bradley) Well-Being Questionnaire
WHO-10	WHO (Ten) Well-Being Questionnaire
WHO-5	WHO (Five) Well-Being Questionnaire
HAP	Health Assets Project
RP	Cohort of a random sample of the general population
ER	Cohort of sick-listed participants (>14 days) reported by the employer
SR	Cohort of self-certified sick-listed participants

Introduction

Subjective well-being (SWB) is one's evaluation of the cognitive and affective dimensions of life and is comprised of several dimensions including overall life satisfaction, satisfaction with important life domains (e.g., work), and the ratio of positive to negative affect [1]. Associated with various health outcomes [1–4], SWB has been measured by the WHO (Bradley) Well-Being Questionnaire (WHO-B). Originally designed to measure depressive mood, anxiety, energy level, and well-being among a multinational sample of European patients with diabetes [6, 7], the scale was comprised of 28 items. Subsequently, the original data were utilized to produce a unidimensional scale with as few items as possible that retained sound psychometric qualities [7]. Sixteen items from the original 28 were selected based on the values of Mokken's coefficient of homogeneity and the scale further shortened to 10 items, comparable with the WHO-B content. To develop an even shorter version, the WHO (Five) well-being index (WHO-5) was

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created [8] and further validated [9], and in 1998, this five-item version was revised to reword a negatively phrased item in a positive matter and response alternatives were increased from four to six [10].

There are several advantages to the WHO-10 and WHO-5 scales: both allow for the detection of change in SWB along a continuum [7] and are brief, easily administered, flexible, and not disease-specific. Given these benefits, the WHO-10 was translated and used in the Swedish PART study [5] and the Health Asset Project (HAP) [6], both large randomized population-based studies. However, the psychometric properties of these Swedish versions of WHO well-being index have not yet been examined. The purpose of the present study is to validate the Swedish translation of the WHO-10 and WHO-5 among three samples of Swedes (general population, sick-listed with a physician's certificate, and sick-listed without a physician's certificate). Internal consistency will be assessed, and the scales' construct validity will be explored. It is hypothesized that (1) WHO-5 and WHO-10 scores will be significantly higher among the general population compared to those who are sick-listed; and (2) WHO-5 and WHO-10 scores will be inversely related to self-reported adverse mental health conditions across all three samples.

Methods

Sample

Baseline data collected in 2008 from HAP, implemented in the region of Västra Götaland in western Sweden, are the data source consisting of three cohorts of Swedes aged 19–64 years: (1) a randomized general population (RP) cohort ($n = 4{,}027$, 50 % response rate; randomly selected by Statistics Sweden); (2) employees sick-listed reported by the employer (ER) ($n = 3{,}310$, 54 % response rate; only sick leave spells longer than 14 days were included); and (3) self-certified sick-listed (SR) individuals ($n = 498$, 50 % response rate). The latter two cohorts comprise incident cases of sickness absence in a period of 2 months, and a systematic random sample of every fourth case was included in SR. For ER, all consecutive cases from a 2-month period were included. For additional details, see Hensing et al. [7].

Instruments

The WHO-10 [7] consists of 10 items and the WHO-5 [8] has 5 questions with a reference period of 1 week rated on a four-point Likert scale ("all of the time" to "never"). Item 1 on both scales is reverse-scored. A sum score is calculated by adding up the ratings with higher scores indicative of increased SWB (see "Appendix"). Measurement of adverse health conditions included participant endorsement of "Mental problems" to the question, "Do you have any lasting illness, health problem or handicap?"; and "Fatigue," "Difficulty getting to sleep," "Waking up frequently and difficulty getting back to sleep," and "Difficulty concentrating" in response to the question, "How often have you had the following symptoms during the past 12 months ("Nearly every day," "Now and again during the week," "Now and again during the month," and "Almost never or never"). Individuals on sick leave also answered the question, "What is the reason for you being on sick leave, according to your medical certificate?" with those endorsing "Depression," "Stress," "Anxiety, worry," "Schizophrenia or another psychotic illness," and "Another mental illness," used in the present analyses.

Statistical analyses

All calculations were run using SAS version 9.3 (SAS Institute, Cary, NC) and were conducted separately for the WHO-10 and WHO-5. Mean differences calculated using one-way ANOVA, and when necessary, Tukey's post hoc tests were performed. The dimensionality of the scales was examined on all three cohorts separately. In the exploratory factor analysis, Kaiser's criteria and a visual examination of the scree plot were utilized to determine the number of factors to retain. Internal consistency (Cronbach's alpha and corrected item-total correlations) was examined for all three subsamples separately. Convergent validity was examined by calculating the correlations between the two scales and adverse mental health outcomes.

Results

See Table 1 for sociodemographic characteristics. For both scales, means were significantly higher in the RP than in the two other samples, and higher in the ER than in the SR ($p < .05$). For both scales, women had a significantly lower mean than men in both the RP and in the ER. However, in the SR, a statistically significant ($p < .05$) difference between women and men was found only for the five-item scale (Table 2).

The WHO-10 Cronbach's alpha was $\alpha = .92$ for the RP, $\alpha = .92$ for the ER, and $\alpha = .95$ for the SR. For the WHO-5, Cronbach's alpha was $\alpha = .83$ for the RP, $\alpha = .82$ for the ER, and $\alpha = .88$ for the SR. Standardized item-total correlations for both scales ranged from .57 to .78. For the WHO-10 and WHO-5, the lowest item-total correlation

Table 1 Sociodemographic characteristics of the three cohorts

Sociodemographic characteristics	RP (n = 4,027), n (%)	ER (n = 3,310), n (%)	SR (n = 498), n (%)
Sex			
Women	2,234 (55)	2,196 (66.3)	325 (65)
Men	1,793 (45)	1,114 (33.7)	173 (35)
Marital status			
Single	1,678 (41.7)	1,049 (31.7)	208 (41.8)
Married	1,881 (46.7)	1,704 (51.5)	219 (44.0)
Divorced	426 (10.6)	509 (15.4)	67 (13.5)
Widowed	42 (1.0)	48 (1.5)	4 (1.0)
Education			
University	1,499 (37.6)	1,104 (33.9)	175 (35.4)
Higher secondary	1,752 (44.0)	1,407 (43.2)	228 (46.2)
Primary	732 (18.4)	749 (23.0)	91 (18.4)
Occupation			
Higher non-manual	843 (22.6)	399 (12.3)	111 (24.8)
Intermediate/low non-manual	1,386 (37.1)	1,139 (35.0)	133 (29.7)
Skilled/non-skilled manual	1,504 (40.3)	1,717 (52.8)	204 (45.5)
Income[a]			
Mean/year, €	25,538	26,736	20,186
Age			
Mean (standard deviation)	43 (13.1)	47 (11.8)	41 (11.0)
WHO-10			
Mean (standard deviation)	18.0 (5.9)	16.1 (6.3)	15.1 (6.9)
WHO-5			
Mean (standard deviation)	6.5 (2.4)	5.7 (2.5)	5.4 (2.7)

Dispersed numbers of participants due to internal missing

[a] Income as mean per year before tax

Table 2 Means and standard deviations (SD) of WHO-10 and WHO-5 (separately) Well-Being Scales for women and men across three cohorts

	RP		ER		SR	
	Mean	SD	Mean	SD	Mean	SD
WHO-10						
Women	17.4*	6.1	15.8*	6.2	14.6	6.6
Men	18.7*	5.7	16.6*	6.4	15.9	7.4
WHO-5						
Women	6.3*	2.4	5.6*	2.5	5.2*	2.5
Men	6.8*	2.4	6.0*	2.6	5.9*	2.9

* Statistically significant difference between women and men ($p < .05$)

was found in the ER for the item "…downhearted and blue…" (.57 for WHO-10 and .54 for WHO-5). Item-total correlations did not indicate removal of any item.

Communalities ranged from .40 to .75 for the WHO-10. The first two eigenvalues were 5.40 and .48. For WHO-5, communalities ranged from .34 to .47 and the first two eigenvalues were 2.35 and .03. Hence, since the visual examination of the scree plot also suggested a unifactorial structure, one factor was retained for both scales and rotation was not possible. The same factorial pattern was found for both scales in all three samples (see Table 3). The figures were stable for women and men.

Convergent validity was examined by calculating the correlations between the scales in adverse health conditions. The correlations showed the same pattern for both scales with negative correlations between −.26 and −.53 for all investigated symptoms (Table 4). The patterns were similar for women and men (figures not shown).

To investigate the convergent validity in relation to self-reported sickness certificate diagnosis, correlations were calculated for the ER sample alone. Only individuals on sick leave when answering the questionnaire were included. For WHO-10, the correlations were −.41 for depression, −.30 for stress, and −.38 for anxiety ($p < .0001$); and for WHO-5, −.31 for depression, −.25 for stress, and −.28 for anxiety ($p < .0001$). Correlations for schizophrenia and other mental health diagnoses were not statistically significant. The patterns were similar for women and men (figures not shown).

Table 3 Factor loadings in the three subsamples

	WHO-10			WHO-5		
	Factor 1 RP	Factor 1 ER	Factor 1 SR	Factor 1 RP	Factor 1 ER	Factor 1 SR
Item 1	.62	.64	.70	.58	.65	.71
Item 2	.64	.68	.71	.67	.71	.71
Item 3	.68	.71	.76	.72	.74	.79
Item 4	.66	.70	.70	.69	.74	.72
Item 5	.82	.82	.87			
Item 6	.83	.83	.87			
Item 7	.77	.74	.79			
Item 8	.79	.80	.82			
Item 9	.68	.69	.70			
Item 10	.70	.71	.76	.63	.62	.68

For WHO-10 and WHO-5, respectively

Table 4 Convergent validity as correlations between WHO-10, WHO-5, and different symptoms of mental health problems, in all three subsamples

	WHO-10			WHO-5		
	RP	ER	SR	RP	ER	SR
Mental health problems	−.30	−.31	−.42	−.26	−.28	−.40
Fatigue	−.51	−.48	−.43	−.50	−.48	−.46
Difficulty getting to sleep	−.40	−.39	−.48	−.36	−.38	−.45
Waking up frequently	−.34	−.36	−.51	−.32	−.36	−.50
Difficulty concentrating	−.53	−.51	−.56	−.47	−.47	−.53

All correlations were statistically significant ($p < .0001$)

Discussion

This analysis of the Swedish translation of the WHO-10 and WHO-5 suggests that the scales have strong psychometric properties. The unidimensionality of the factor structures was consistent across all samples, and the measures of internal consistency were very good to excellent. Evidence for construct validity of the scales emerged from the analysis, with the first hypothesis confirmed: those in the general population had higher SWB than those in the sick-listed samples. The second hypothesis was mostly supported: across all three subsamples, those with higher scores were less likely to self-report adverse health conditions. In the ER sample, those with a self-reported diagnosis of depression, stress, and anxiety also scored lower on the scales, although there was no relationship between scale scores and schizophrenia or other mental disorders.

This study adds to the growing body of research which suggests that the WHO SWB measures, particularly the WHO-5, have good construct validity that can be used cross-culturally with a variety of subpopulations for screening and research purposes. For example, Lucas-Carrasco [8] examined the psychometric properties of a Spanish version of the WHO-5 among a sample of older adults and found that the scale had good convergent validity with other valid measures of quality of life and depression. Consistent with the findings of the present study, the scale also correlated in the expected direction with a number of health problems. Similar results were found in other validation studies of the WHO-5 among Arabic elders [9], people who had attempted suicide in Estonia [10], and a large sample of rural villagers aged 18–65 from Brazil [11].

The current study has several strengths including robustness of the findings due to consistency across subsamples, and internal consistency results, convergent validity, and factor loadings mostly showed similar patterns in women and men. The large, population-based sample provides some justification for cautious generalization (i.e., note 50 % dropout rate) to the Swedish population. Although analyzing convergent validity in relation to several relevant outcomes, this study focused on self-reports and not clinical diagnoses, a notable weakness. Another issue to consider is that item 1 (…downhearted and blue) on both scales showed consistently lower factor loadings in comparison with the other items. Since this item is negatively worded, it is possible that it may not fully fit with a latent factor otherwise focusing on positive aspects of SWB rather than the absence of depressive symptoms. In another version of the WHO-5 (not tested in this study), this was taken into consideration and the first item re-formulated into "…cheerful and in good spirits" [10]. In conclusion, the Swedish translation of the WHO-10 and WHO-5 is psychometrically sound, but the first item of both scales has weaker psychometric qualities in comparison with other scale items.

Appendix

See Table 5.

Table 5 The Swedish translation of the WHO-10 and WHO-5 Well-Being Scales

	Hur har du mått den senaste veckan? *How have you felt during the past week?*	Hela tiden *All of the time*	Ofta *Often*	Ibland *Sometimes*	Aldrig *Never*
1[a]	Jag har känt mig ledsen och nere *I have felt downhearted and blue*	0	1	2	3
2[a]	Jag har känt mig lugn och avslappnad *I have felt calm and peaceful*	3	2	1	0
3[a]	Jag har känt mig energisk, aktiv och företagsam *I have felt energetic, active, or vigourous*	3	2	1	0
4[a]	När jag har vaknat upp har jag känt mig pigg, utvilad och företagsam *I have been waking up feeling fresh and rested*	3	2	1	0
5	Jag har känt mig lycklig eller nöjd och belåten med mitt personliga liv *I have been happy and, satisfied, or pleased with my personal life*	3	2	1	0
6	Jag känner mig tillfreds med min livssituation *I have felt well adjusted to my life situation*	3	2	1	0
7	Jag lever det slags liv som jag vill leva *I have lived the kind of life I wanted*	3	2	1	0
8	Jag har varit pigg på att ta itu med dagens arbete eller fatta nya beslut *I have felt eager to tackle my daily tasks or make new decisions*	3	2	1	0
9	Jag har känt att jag kan klara av allvarliga problem eller förändringar i mitt liv *I have felt I could easily handle or cope with any serious problem or major change in my life*	3	2	1	0
10[a]	Jag har känt att livet är fullt av intressanta saker *My daily life has been full of things that were interesting to me*	3	2	1	0

English wordings in italics

[a] Items included in the WHO-5 Well-Being Scale

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