

# Internal and external validity of the WHO Well-Being Scale in the elderly general population

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The objectives of this study were (i) to evaluate the validity of the WHO Well-Being Scale in elderly subjects and (ii) to assess the influence of demographic variables on subjective quality of life. A sample of 254 elderly subjects completed the 22-item WHO Well-Being Scale. The scale had an adequate internal and external validity. However, the short 10-item and 5-item versions were equally valid. Low scores indicating decreased well-being were related to the presence of a psychiatric disorder or, independently, to poor living conditions. The Well-Being Scale and their short versions would appear to be useful instruments for identifying subjects with reduced subjective quality of life.

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## Introduction

### Development of the WHO Well-Being Scale

There is increasing awareness of the necessity to assess health-related quality of life in patients with organic and psychiatric disorders (1–4). The concept of health-related quality of life refers on the one hand to a subjective experience to be assessed by the individual under examination (i.e. subjective well-being), and on the other hand to a multi-dimensional approach to health and disease, including psychological, physical and social aspects.

The Psychological General Well-Being Scale is one of the scales most frequently used to measure self-evaluated psychological well-being in patients and in the general population (5, 6). When planning a European study on the quality of care for patients with insulin-dependent diabetes mellitus, the World Health Organization Regional Office for Europe considered the Psychological General Well-Being Scale and the Zung Scales for Anxiety and Depression (7, 8). A primary 28-item WHO Well-Being Scale (WBS) was developed for the evaluation of subjective quality of life using items of these scales (9). The author later selected 22 items for the WHO Well-Being Scale (WBS-22) for measuring subjective psychological well-being, including depression, anxiety, energy and positive well-being, in diabetes patients. To increase the acceptability of the scale for other samples, shorter versions were much sought after.

### Validation of the WHO Well-Being Scale

A recent psychometric analysis showed that 10 of the 28 primary items captured the dimension of psychological well-being sufficiently well. The total score was chosen as an index of subjective well-being (WBI-10) (8, 10). The 10 items of the WBI-10 identified by Bech et al. (8), and 5 items of a shorter index recently proposed by Bech (WBI-5) (10), are included in the 22-item version.

The WBS has been proposed for widespread application including both patients and the general population (11, 12). However, the validity of the WBS-22 and of the short versions has not been assessed in the elderly general population (i.e. internal, discriminant and concurrent validity). The WBS might be used to detect those with reduced subjective quality of life and thus increased need of psychological and social support in this relevant sample. Consequently, the primary aim of the present study was to evaluate the different versions of the WHO Well-Being Scale in a sample from the elderly general population.

Different factors might influence general well-being in the elderly population. Those known to have an influence on subjective quality of life can be used for validity assessment, e.g. the presence of psychiatric disorders. The influence of other factors (e.g. age, gender, educational level and living

conditions) on subjective well-being can be examined if the validity of the scales has been proven.

### Material and methods

#### Study sample

A random sample of 1305 subjects aged over 60 years from the elderly general population was selected with the support of the city census office in Mainz, Germany. The sampling strategy and recruitment results have been described recently (13). Briefly, the subjects formed part of a stratified sample with an over-representation of older and male subjects. All subjects were contacted by mail and later by telephone calls if possible. A liberal recruitment procedure led to a low interview rate, i.e. 24.4% of the living subjects. The participants represented a convenience sample with a bias towards younger subjects, more often male and married, and with less psychiatric morbidity than the remaining elderly general population. This selection might reduce the representativity of the sample, but it should not affect the assessment of the validity, e.g. the comparison of scores in subjects with or without psychiatric disorders, and the comparison of different scales in the sample. The present report is restricted to 254 subjects who completed a 2-h psychiatric interview. In total, 29 subjects (11.4%) had a current psychiatric disorder at the time of the interview. Diagnoses observed in more than one individual were dementia of the Alzheimer type ( $n=15$ ), anxiety disorder ( $n=8$ ) and major depression ( $n=2$ ). Table 1 lists the demographic parameters of the study sample.

#### Diagnostic interviews and quality of life assessment

Personal interviews used the Composite International Diagnostic Interview (CIDI) (14), the Center for Epidemiological Studies Depression Scale (CES-D) (15), the Structured Interview for the Diagnosis of Dementia of the Alzheimer-type, Multi-Infarct Dementia and Dementias of other Aetiology according to ICD-10 and DSM-III-R (SIDAM) (16), and the Blessed Dementia Rating Scale (BDRS) (17). The CIDI is a structured psychiatric interview for the assessment of various psychiatric disorders designed for application by lay interviewers. The CES-D is designed to identify symptoms of depression in the general population. The SIDAM is a diagnostic instrument that allows the diagnosis of dementia based on ICD-10 and DSM-III-R criteria, which includes the Mini-Mental Scale (MMS), an indicator of cognitive dysfunction (18). The BDRS assesses dementia-related changes in functional capacities, i.e.

changes in the performance of everyday activities, habits, personality, interest and drive (17). Subjective quality of life has been evaluated using the German 22-item version of the WHO Well-Being Scale (WBS-22, provided by Bradley in agreement with the WHO) (9).

The interviewers were medical students in their sixth year at medical school. Their training consisted of a 4-week stay in a gerontopsychiatric ward and intensive training with interview modules. Interviewers were continuously supervised during the study. Final diagnoses according to ICD-10 criteria (19) were made by consensus of two psychiatrists with several years experience in gerontopsychiatry using all of the available information (i.e. the best-estimate procedure; 20).

#### Assessment of internal validity

The assessment of internal consistency of the well-being scales was performed by calculations of Cronbach's coefficient alpha, Loevinger's and Mokken's coefficients of homogeneity. Cronbach's alpha, a commonly used indicator of the internal consistency of a scale, estimates an average coefficient from item intercorrelations of a scale (21). It is dependent on the number of items in the scale, with a higher number of items yielding a higher coefficient. The alpha coefficient is used when there are more than two response alternatives for an item (polytomous items). If an alpha coefficient is very high ( $>0.9$ ) it may suggest a high level of item redundancy; thus it should be within the range 0.7–0.9 (22). The Loevinger coefficient of homogeneity is a general coefficient of scalability (23) which estimates the extent to which the items provide additional information about the dimension being measured. To ensure that the total score of the scale is an adequate statistic, Mokken coefficient estimates each individual item. Mokken coefficients indicate the contribution of different items to the total score (24). We have used the procedure for the analyses of the polytomous items (25). Coefficients in the range 0.30 to 0.39 are regarded as just barely acceptable, while coefficients of 0.40 or higher are regarded as more adequate for the inclusion of an item in a scale (24).

#### Assessment of external validity

Discriminant validity was evaluated by comparing WBS scores in subjects with and without current psychiatric disorders. Current psychiatric disorders are known to reduce subjective well-being (2–4). The performance of different WBS versions was

Table 1. Description of the 254 elderly subjects who completed the Well-Being Scale

Variable	Mean ± SD (range)
Age (years)	77.2 ± 10.08 (60–99)
Sex (% male)	42.5
Duration of formal education (years)	9.5 ± 2.24 (9–13)
Last professional job (%)	
None	13.4
Unskilled	8.7
Skilled	62.2
Academic	15.4
Marital status (%)	
Married	44.9
Widowed	43.3
Separated	1.2
Divorced	2.0
Unmarried with partner	0.8
Single	7.9
Living conditions (%)	
Living alone	37.4
Living with partner	47.7
Living with relatives	6.4
Institutionalized	8.4
Psychiatric diagnosis (DSM-III-R) (current/lifetime)	
Dementia (%)	5.9/5.9
Depression (%)	0.8/3.9
Anxiety disorder (%)	3.1/7.1
Any psychiatric disorder (%)	11.4/22.4
CES Depression Scale Score	14.0 ± 4.2 (6–33)
Blessed Dementia Rating Scale (BDRS) score	0.68 ± 1.6 (0–10)
Mini-Mental Scale (MMS) score	27.4 ± 2.56 (11–30)

compared using receiver operating characteristic analysis (ROC) (26, 27). Concurrent validity was assessed by correlations of WBS scores with the following scales that measure variables that are indirectly related to subjective well-being: the CES-D, the BDRS and the MMS. All scales should correlate with subjective quality of life to some

extent. However, they measure different aspects of life. Therefore these correlations should be significant, but also much lower than 1, e.g. conditions that reduce cognitive performance should reduce subjective quality of life to some extent, but in a different way and possibly to a lesser extent than factors which measure performance in everyday activities. Spearman rank correlation coefficients were used because WBS scores were not normally distributed.

Exploratory data analysis

The influence of other variables on subjective well-being was assessed by ANCOVA (dependent variables: well-being scores and subscores; covariates: age in years, educational level expressed as number of years in school; independent variables: presence/absence of a psychiatric disorder, gender, last profession, i.e. unskilled work, skilled work, academic position), marital status and living conditions (see Table 1). Although the WBS scores were not normally distributed, ANCOVA was performed and used to assess the proportion of variance explained by different factors. ANCOVA is assumed to be robust to such deviations if samples are sufficiently large (28). A transformation of raw data was not chosen to reach a normal distribution because the interpretation and explanation of results would become complicated. All factors were entered simultaneously in the calculations. In order to exclude negative results due to possible interactions of different variables, one-factorial ANOVAs were recalculated for all individual

Table 2. Well-being scores and subscores in different subsamples defined by the presence or absence of current psychiatric disorder<sup>a</sup>

Scales <sup>b</sup>	Subjects with current psychiatric disorder (n=29)	Subjects without current psychiatric disorder (n=225)	Total sample (n=254)
Depression subscore	5.4 ± 3.6	2.1 ± 2.5	2.5 ± 2.9
0–18 (0)	(5; 0–13)	(1; 0–13)***	(2; 0–13)
Anxiety subscore	4.9 ± 3.6	2.1 ± 2.3	2.5 ± 2.7
0–18 (0)	(4; 0–15)	(1.5; 0–10)**	(2; 0–15)
Energy subscore	7.3 ± 3.0	10.3 ± 3.0	9.8 ± 2.5
0–12 (12)	(8; 0–12)	11 (1–12)***	(11; 0–12)
Positive well-being subscore	12.2 ± 4.3	15.8 ± 3.1	15.3 ± 3.5
0–18 (18)	13; 4–18	(17; 3–18)***	(17; 3–18)
WBS-22 total score	45.2 ± 11.3	57.8 ± 8.6	56.2 ± 9.9
0–66 (66)	(47; 24–62)	(60; 21–66)***	(59; 21–66)
10-item Well-Being Index	20.0 ± 6.7	25.8 ± 4.9	25.2 ± 5.4
0–30 (30)	(21; 6–28)	(28; 4–30)***	(27; 4–30)
5-item Well-Being Index	9.4 ± 3.5	12.7 ± 2.6	12.3 ± 2.9
0–15 (15)	(10; 2–14)	(13; 2–15)***	(13; 2–15)

<sup>a</sup> Mean values ± SD are shown, with median and range in parentheses.

<sup>b</sup> Possible range is shown, with best value in parentheses.

\*\* Significant difference between subjects with and without current psychiatric disorder; Wilcoxon U-test, P < 0.01.

\*\*\* Significant difference; Wilcoxon U-test, P < 0.001.

Table 3. Indicators of internal validity of different versions of the Well-Being Scale<sup>a</sup>

WHO Well-Being Scale versions (WBS/WBI) with their item numbers	Cronbach's alpha	Loevinger's coefficient of general homogeneity
WBS-22	0.94 (0.90–0.98)	0.38 (0.37–0.39)
WBI-10	0.93 (0.88–0.97)	0.48 (0.46–0.50)
WBI-5	0.95 (0.91–0.99)	0.41 (0.37–0.45)

<sup>a</sup> 95% confidence intervals are shown in parentheses.

factors. However, this procedure did not change the results. To account for multiple testing without being excessively conservative, significance was assumed with a *P*-level of <0.01.

## Results

Internal validity of the WHO Well-Being Scales

Table 2 shows the score distributions of the 22-item version of the WBS (WBS-22) and its subscales. The distributions of WBS scores were highly skewed to the left or right for all scale versions (i.e. WBS-22, WBI-10 and WBI-5) and the subscales of the WBS-22. Most subjects scored near the maximum (WBS-22, WBI-10, WBI-5, subscores for energy and positive well-being) or minimum (subscores for depression and anxiety), corresponding to unaffected or normal subjective well-being. The median scores of all subscales were near the scale margins, i.e. 1 or 2 points below the upper limits or above the lower limits in the total sample. Few subjects scored substantially higher or lower, indicating reduced subjective well-being.

Table 3 shows Cronbach's coefficient alpha and Loevinger's coefficient of general homogeneity. The Cronbach coefficients were high without significant differences between the three versions. The internal consistencies of the subscales of the 22-item Well-Being scale were good. Cronbach's coefficient alpha for the subscales were as follows: depression (items 1–6), alpha = 0.72; anxiety (items 7–12), alpha = 0.66; energy (items 13–16), alpha = 0.80; positive well-being (items 17–22), alpha = 0.87.

The Loevinger coefficient of general homogeneity showed that the WBI-10 and the WBI-5 had coefficients higher than 0.40, but only the coefficient for WBI-10 differed from the coefficient of the total scale (WBS-22) in terms of 95% confidence limits.

Table 4 shows the Mokken coefficients of homogeneity of the WBS-22. The individual Mokken coefficients of all items in the two short versions (WBI-10 and WBI-5), except for two items (item 11, 'calm and peaceful'; item 19, 'lived life as wanted'), were 0.40 or higher, indicating an

Table 4. Mokken scores for individual items of the WHO Well-Being Scale (WBS-22)

Subscale	Item number	Short item description	Mokken score
Depression subscale	1	Feel useful	0.38
	2	Crying spells	0.27
	3	Think clearly	0.30
	4	Full life	0.39
	5 <sup>a,b</sup>	Downhearted and blue	0.42
	6	Enjoy things	0.40
Anxiety subscale	7	Nervous and anxious	0.36
	8	Afraid for no reason	0.30
	9	Get upset easily	0.24
	10	Going to pieces	0.37
	11 <sup>a,b</sup>	Feel calm	0.31
	12	Good sleep	0.27
Energy subscale	13 <sup>a,b</sup>	Feel energetic	0.46
	14	Feel dull	0.40
	15	Feel tired	0.38
	16 <sup>a,b</sup>	Wake up feeling rested	0.43
Positive Well-Being subscale	17 <sup>a</sup>	Satisfied with life	0.43
	18 <sup>a</sup>	Adjusted to life situation	0.46
	19 <sup>a</sup>	Lived life as wanted	0.34
	20 <sup>a</sup>	Eager for tasks	0.47
	21 <sup>a</sup>	Handle problems easily	0.45
	22 <sup>a,b</sup>	Interesting life	0.48

<sup>a</sup> Item included in the 10-item Well-Being Index (WBI-10).

<sup>b</sup> Items included in the 5-item Well-Being Score (WBS-5).

adequate level of consistency. In addition to these eight items, two items of the WHO-22 had coefficients of 0.40 or higher, namely item 6 ('still enjoying things') and item 14 ('feel dull').

Table 5 shows the correlations between WBS total scores and subscores. Significant correlations between the total WBS scores and between the subscales indicate that different aspects of subjective well-being are closely related to each other.

Detection of any psychiatric disorder (discriminant validity)

Table 2 shows the WBS scores in the total sample and in subjects with and without current psychiatric disorders. A satisfactory discriminant validity was observed, i.e. the total scores and all subscores of subjects with and without any current psychiatric disorder were significantly different (see Table 2). The presence of any current psychiatric disorder accounted for 5% of the total variance of the WBS-22 score (8.8% of the variance of the WBI-10; 9.9% of the variance of the WBI-5; between 4 and 7% of the variance of individual subscores of WBS-22; all *P* < 0.001). Figure 1 shows that the ROC analysis for the detection of any current psychiatric disorder by the scales identified an area under the curve of 0.81 for the whole scale (WBS-22, 95% confidence interval (95% CI) = 0.74–0.89) and of 0.79 for both subscales (WBI-10, 95% CI = 0.71–0.86; WBI-5, 95% CI = 0.72–0.87), which in all cases was

## Validity of the WHO Well-Being Scale

Table 5. Intercorrelations of WBS scores and subscores, and correlations with external scales measuring functions related to subjective well-being<sup>a</sup>

	Depression	Anxiety	Energy	Positive well-being	WBS-22 total score	10-item Well-Being Index (WBI-10)	5-item Well-Being Index (WBI-5)
Depression	1	0.54*** (0.48–0.72)	–0.70*** (–0.74–0.99)	–0.67*** (–0.70–0.94)	–0.87*** (–0.84–0.90)	–0.79*** (–0.73–0.83)	–0.79*** (–0.74–0.83)
Anxiety		1	–0.55*** (–0.50–0.74)	–0.50*** (–0.42–0.67)	–0.76*** (–0.70–0.81)	–0.66*** (–0.59–0.72)	–0.73*** (–0.56–0.78)
Energy			1	0.59*** (0.56–0.80)	0.84*** (0.80–0.87)	0.75*** (0.69–0.80)	0.80*** (0.76–0.84)
Positive well-being				1	0.82*** (0.78–0.86)	0.89*** (0.86–0.91)	0.72*** (0.66–0.77)
WBS-22 total score						0.94*** (0.93–0.96)	0.93*** (0.91–0.94)
CES-D	0.33*** (0.22–0.47)	0.40*** (0.30–0.55)	–0.32*** (–0.21–0.45)	–0.32*** (–0.21–0.45)	–0.40*** (–0.29–0.50)	–0.39*** (–0.28–0.49)	–0.40*** (–0.29–0.50)
BDRS	0.38*** (0.29–0.52)	0.27*** (0.16–0.39)	–0.38*** (–0.28–0.52)	–0.36*** (–0.25–0.49)	–0.41*** (–0.30–0.51)	–0.34*** (–0.22–0.46)	–0.35*** (–0.23–0.46)
MMS	–0.19** (–0.07–0.32)	–0.14* (–0.02–0.27)	0.21** (0.09–0.34)	0.18** (0.05–0.34)	0.21** (0.09–0.33)	0.20*** (0.08–0.31)	0.21*** (0.09–0.33)

<sup>a</sup> Spearman correlation coefficients are shown, with 95% confidence intervals in parentheses.

\*  $P=0.025$ , \*\*  $P<0.01$ , \*\*\*  $P<0.001$ .

significantly different from 0.5 (i.e. the area under the curve in the case of non-discrimination), but was not significantly different between the scales.

### Concurrent validity

Well-being scores correlated significantly with the total score on the CES-D scale (see Table 5). They also showed significant correlations with the BDRS score and, to a lesser extent, with the MMS. These correlations are sufficiently satisfactory to assume a reasonable concurrent validity of the WBS scales. Stronger correlations could not be expected because the concurrently used scales do not

assess quality of life directly, but measure different aspects of cognitive, social and subjective functions which are assumed to be related to subjective well-being.

### Other variables influencing the quality of life

Living conditions significantly influenced subjective well-being without any significant interaction between living conditions and the presence of an acute psychiatric disorder ( $P>0.1$ ). They accounted for 9% of the total variance in the WBS-22 score (5% of WBI-10; 3.5% of WBI-5). Subjects living alone or with a partner had higher well-being scores than subjects living with relatives or in a home for the elderly (Scheffé test procedure for positive results in ANCOVA,  $P<0.05$ ). The variance of the subscores that was accounted for by living conditions ranged from 2% (anxiety) to 10% (positive well-being). Women had significantly higher anxiety scores than men, and gender accounted for 2% of the total variance of the anxiety subscore. Other factors, e.g. age, marital status, level of education, last professional occupation and previous psychiatric disorders, had no significant influence on subjective WBS scores or subscores.

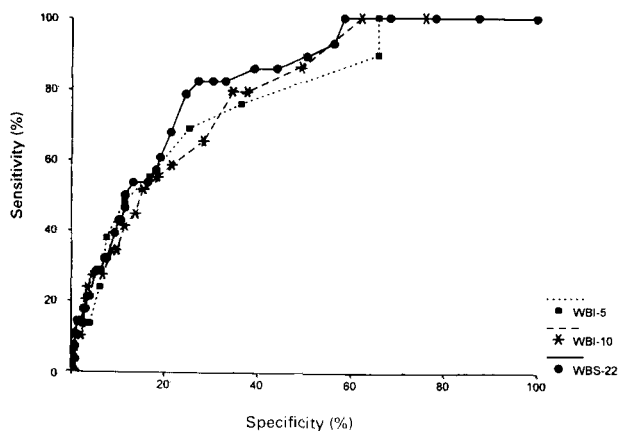


Fig. 1. Receiver operating characteristic curves for different WBS scales. WBI-5, 5-item Well-Being Index; WBI-10, 10-item Well-Being Index; WBS 22, 22-item Well-Being Scale total score.

## Discussion

### Scale performance and internal validity

In agreement with Bech et al. (8), the results of the internal validity assessment indicated an adequate

internal consistency and homogeneity of the WBS-22. The distributions of total scores and of subscores were relatively skewed, i.e. the median values in the total sample were near the upper or lower scale limits, respectively, which indicated an unaffected status. Thus mean values and standard deviations are less adequate for describing and comparing different samples. The scale appears to be more appropriate for identifying subjects with reduced subjective well-being. The same is true of the short versions.

The high Cronbach's coefficient alpha and Loevinger's coefficient of the WBS-22, WBI-10 and WBI-5 indicate adequate internal validity of all scale versions. The WBI-10 appears to be the version with the highest homogeneity. The advantage of the longer 22-item WBS might be the inclusion of different subscales. However, in the present sample all subscales were highly intercorrelated, and sufficiently independent subscores were not provided in this sample.

#### External validity

In agreement with the study hypothesis, all WBS scales were able to discriminate between patients with and without acute psychiatric disorders. The presence of psychiatric disorder significantly influenced subjective well-being. In support of these findings, we observed a reasonable concurrent validity of the scale. Subjective well-being was significantly correlated with different indicators of psychiatric morbidity that are frequently observed in the elderly, i.e. depressive feelings (CES-D), reduced performance in activities of daily living (BDRS) and cognitive impairment (MMS). Consistent with these data, Lehman et al. (3) reported subjective discomfort with different aspects of life satisfaction in patients with chronic mental disorders. Subjective quality of life was found to be reduced in subjects with anxiety disorders (29, 30) and in those with depression (31–33).

#### Variables that influence subjective well-being

We observed a significant influence of living conditions on subjective well-being independent of the presence or absence of a psychiatric disorder. Subjects living alone or with partners had the highest levels of subjective well-being. In support of this finding, Thompson and Heller (34) reported that social isolation reduced psychological well-being. Browne et al. (35) observed that schizophrenics living with their families had a higher quality of life than those living in hostels or group homes. In contrast, Kirchman and Schulte (36)

observed a better subjective life satisfaction in patients living in a sheltered home compared to those living in the community. One reason for the higher level of subjective well-being in this sample might be the better social support that subjects received. Corrigan and Buican (31) observed that depression and social support were independently associated with subjective quality of life.

However, the relationship between subjective well-being and living conditions, including social support, is complicated by its dependence on subjective values. For example, Thompson and Heller (34) reported that social isolation reduced psychological well-being independently of perceived social support. However, perceived support improved well-being only when it was provided by family members, but not if given by friends. Consequently, the reasons for the observed relationship between living conditions and subjective well-being in the general population cannot be explained simply by analogy with other study results. Further examination of the issue is needed.

In agreement with the study by Bech et al. (8), well-being was not influenced by age in the present elderly sample. Gender and level of education were not associated with subjective well-being. However, in the study by Bech et al. (8) men scored higher on the well-being scale, indicating a better subjective quality of life. In contrast, Nagatomo et al. (33) observed that men had a lower quality of life than females. However, sex differences were not seen on the concurrently used Zung Depression Scale. The items of the WBS-22 scale have been partly derived from the Zung Depression Scale, so the absence of sex differences in our sample does not contradict this study. These differences in all three studies, namely better subjective well-being of men in a diabetes sample (8), poorer quality of life in male visitors at a Japanese day-service centre, and equal scores in the elderly general population, indicate that confounding factors might influence the observed relationships between gender and well-being.

#### Conclusions and limitations

The WBS-22 scale was found to be applicable and has shown an adequate internal and external validity in the elderly general population. The same applies to the short versions, namely the WBI-10 and WBI-5. However, due to the skewed distribution of scores, the scales appear to be more adequate for identifying subjects with low subjective well-being than for comparing well-being in different populations.

Although the scales are valid to the extent that

subjects with psychiatric disorders can be identified, the variance explained by the presence of a psychiatric disorder is limited in this sample from the general population, of which only a small proportion is suffering from psychiatric disorders. Due to the small numbers of subjects with different psychiatric disorders we were unable to determine the influence of different psychiatric disorders on subjective well-being.

The present results do not directly demonstrate that the scale measures subjective well-being or subjective quality of life. It might be argued that the scale measures psychiatric symptoms but not quality of life, and therefore detects subjects with current psychiatric disorders or, alternatively, that the presence of a psychiatric disorder influences response behaviour and therefore allows the identification of subjects with a psychiatric disorder. Reduced subjective well-being and the presence of a psychiatric disorder are highly correlated and cannot be adequately differentiated because reduced subjective quality of life represents a cardinal symptom not only of depression, but also of any psychiatric disorder. However, the observed correlations between WBS scores and other concurrent scales and the observed independent relationship between WBS scores and living conditions which are known to affect subjective quality of life support the assumption that some health-independent aspects of subjective quality of life are measured by the WBS. In addition, the independence of the relationship between WBS scores and the presence of a psychiatric disorder and of WBS scores and living conditions makes it unlikely that WBS scores are simply health related. It seems more likely that the scale measures subjective well-being which is dependent on the above-mentioned variables.

Other factors might also influence subjective well-being. The influence of a number of variables, e.g. sex, age, level of education, marital status and living conditions, on subjective well-being might be confounded by various environmental factors and unknown interactions between variables. Thus conclusions drawn from the negative findings for the present sample cannot easily be generalized to other samples from the general population, and vice versa. Generalization of the results might also be limited as a consequence of the observed selection effects, e.g. subjects with severe physical and mental disorders did not participate in the 2-h interview. This non-respondent bias cannot be excluded in studies of the general population. However, it should not affect the assessment of internal and external validity.

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