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Quality of life in psychiatry: a systematic contribution to construct validation and the development of the integrative assessment tool "modular system for quality of life"

Abstract The aim of the present study is to contribute to an ongoing validation process of the Quality of Life (QoL) construct in the clinical field by investigating its internal structure. Eight (inter)nationally validated questionnaires have been analyzed by an integrative approach in a multicenter study. Data has been collected in a mentally healthy ($n = 479$), a depressed ($n = 171$) and a schizophrenic ($n = 139$) sample. Apart from conventional psychometric criteria a similarity structure analysis (SSA) within a facet analytic methodology has been applied. A dimensional structure of the resulting integrative questionnaire "Modular System for Quality of Life" (MSQoL) could be generated that consists of one "G-factor" (life in general) and six specific dimensions (physical health, vitality, psychosocial relationships, material resources, affect, leisure time). This basic structure represents a core module measured by 47 items which is sufficiently valid for all three samples. The empirical structures of healthy, depressed and schizophrenic samples fulfill the first law of attitude and share a common variance of 95 %. In addition, there are four specific modules (demography, family, partnership, profession). No specific modules could be identified for the psychopathological subgroups. The conclusion can be drawn that QoL is construed very similar by all three investigated populations which is the base for searching for quantitative differences and profiles. The

MSQoL integrates the non-redundant components of eight QoL-instruments, is psychometrically able to assess the basic structure and can be completed within a cumulative research design by items specific for a particular setting.

Key words Quality of Life · Validity · Depression · Schizophrenia · Facet analysis

Introduction

The construct Quality of Life (QoL) has become very popular within the last two decades in many different empirical sciences such as psychology, sociology or medical research (see Andrews and Withey 1978; Bowling 1991; Campbell et al. 1976; Diener 1984, 1994; Spilker 1990; Stewart and Ware 1992; Wenger et al. 1984). However, there has been a significant lack of theoretically-based research. For the most part, QoL studies have either been accomplished atheoretically or they have been based on very global, abstract and diverse models (Atkinson et al 1997; Browne et al 1996; Campbell et al. 1976; Corrigan and Buican 1995; Diener 1984, 1994; Heinrichs et al. 1984; Koivumaa-Honkanen 1996; Larsen and Gerlach 1996; Lehman et al. 1982; Malm et al. 1981; McSweeny 1982; Oliver 1991; Skantze et al. 1992; Spitzer et al 1981; Stein and Test 1980). Such models allow hardly any room for testing single hypotheses with potential falsifiers, and this makes a systematic validation of the QoL construct very complicated. Similarly, the immense number of heterogenous measurement instruments used means that the results cannot be compared with each other because of different conceptualizations. There are instruments with two dimensions (e.g., Affect Balance Scale; Bradburn 1969), three (e.g., Quality of Life scale by Corten et al. 1994), four (e.g., Munich Quality of Life Dimensions List; Heinisch et al. 1991), six (e.g., Nottingham Health Profile; Hunt et al. 1986), eight (e.g., Short Form 36; Stewart and Ware 1986), eleven (e.g., Lancaster Quality of Life Profile; Oliver 1991), twelve (e.g., Sickness Impact Profile; Bergner et al., 1981) or even fourteen and

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more dimensions (e.g., Oregon Quality of Life Questionnaire; Lehman, 1988). Besides the question of dimensionality, there are many more theoretical as well as empirical problems to be solved (for example, the relation between generic and specific instruments; positive and negative aspects of QoL; subjective and objective approaches; correlative relationships and confoundations with concepts of personality, psychopathology, mood states or demography; reliability and sensitivity).

This diffuse modeling of QoL has serious implications for applied research. Kirshner and Guyatt (1985) give an overview of clinical functions that can be fulfilled by QoL: It can be used as a discriminative index (e.g., discriminating schizophrenics and healthy controls), a predictive index (e.g., predicting long-term outcome from QoL at the beginning of a particular therapy) and an evaluative index (e.g., sensitivity of QoL while treating patients with atypical neuroleptics). However, before using QoL to answer clinically relevant questions and to fulfill these functions, it is necessary to clarify the concept by empirical validation and make results more independent of a particular instrument. Otherwise, there will be as many constructs as measurement tools.

The present study systematically contributes to an ongoing validation process of QoL. An additional result of this process is the development of a QoL inventory with sufficient construct validity based on an integrative approach taking into account the empirical and conceptual heterogeneity. Therefore, eight (inter)nationally established QoL instruments have been compared to discover redundancies and idiosyncracies and to integrate the different models implicated by these instruments. The present paper describes the validation process of 49 items that have been extracted from the set of instruments investigated. For the problem of specific vs. generic instruments (Patrick and Deyo 1989), a modular approach has been used. Following QoL research in oncology (Aaronson et al. 1988), a core module with life areas significant for a larger population and specific modules measuring aspects of life relevant for specific (psychopathological) subpopulations will be sought. At this time only the core module will be presented in detail. The study has been supported by the working group "Quality of Life" within the "Society for Methodology and Documentation in Psychiatry" (Arbeitsgemeinschaft für Methodik und Dokumentation in der Psychiatrie; AMDP).

Subjects, instruments and methods

Samples

The mentally healthy sample ($n = 479$) was studied in the general population of several metropolitan areas in North-Rhine-Westfalia (Germany) from spring 1995 to spring 1996. About half of the subjects were students, and this accounts for the demographic peculiarities of the sample (see Table 1). Because of anonymity, personal contact (the questionnaires were handed out at public locations or to acquaintances of the primary investigators) and a telephone card reward (presented when the questionnaires were correctly returned); the response rate was 91 %. Due to the fact that participation was voluntary and linked to an oral consent after personal information, the ecological validity is necessarily limited. N = 76 subjects filled out the questionnaires for a second time 14 days later to test reliability.

N = 171 depressed patients (ICD-10 diagnoses F31.3, F31.4, F31.5, F32.x, F33.x; WHO 1993) were recruited in open wards and day-hospitals in the university psychiatric hospitals of Aachen, Freiburg, Jena, Cologne and Munich, the municipal hospital Fulda and a psychiatric medical practice in Duren from summer 1995 to autumn 1996 (see Table 1).

N = 139 schizophrenic patients (ICD-10-diagnosis F20.x) were recruited in the same institutions (and additionally at Hamburg university hospital) during the same period (see Table 1).

Data collection in the clinical samples was restricted by the following conditions: No patient was consulted during an acute phase of the disease. In general, the date for filling out the questionnaires was about two weeks before discharge. In all cases patients had to be in a stable condition and compliant in regard to the task. Questionnaires were dispensed by coworkers and were collected two to three days later. If necessary these coworkers answered questions and helped the patients to understand the items.

The samples show some demographic characteristics that correspond to clinical experience: Depressed patients are older and socially as well as professionally better adapted than schizophrenics. However, it can be regarded as a reliable finding in QoL research that demographic (objective) features have only negligible (although sometimes significant) effects on QoL. This is particularly the case, if the demographic features are investigated in a multivariate context and the dependent variable is subjective well-being (Andrews and Withey 1978; Campbell et al. 1976; Larsen and Gerlach 1996; Lehman 1983).

The impact of different sites (and hospitals) on QoL (operationalized by different sum scores of the applied instruments) was tested by ANOVA: In the depressed sample (6 sites and $n = 164$ patients; Cologne was omitted because the contribution was too small) 4 of 90 Tukey post hoc tests reached significance (homogenous variances; adjusted $\alpha = 5\%$). In the schizophrenic sample (5 sites and $n = 132$ patients; Hamburg and Duren were omitted because the sample sizes were too small), none of the Tukey post hoc tests became significant (homogenous variances; adjusted $\alpha = 5\%$). Therefore, it can be assumed that the site of data collection in the clinical samples is insignificant and the data can be pooled without restrictions.

Instruments

The QoL instruments for the integrative analysis were selected according to the criteria of psychometric quality, how well they are established nationally and internationally and how many different conceptual aspects discussed in the QoL literature were covered. For example, both objective (demographic, behavioral) and subjective components were considered. All instruments were applied as self-ratings.

1. Sickness Impact Profile (SIP; Bergner et al. 1976, 1981): The SIP is a behaviorally oriented instrument measuring health-related dysfunctions in patients with acute and chronic diseases (136 dichotomous items; 12 subscales). An integrated version based on two SIP variants translated into German by an international workshop was used in the present study (Bullinger 1995a).

2. Nottingham Health Profile (NHP; European Group for Quality of Life and Health Measurement 1992; Hunt et al. 1986): The NHP assesses the subjective experience of health problems (38 dichotomous items; 6 subscales). The German version was translated by an international working group and was an amalgam of three former versions (Bullinger 1995a; Kohlmann et al. 1997).

3. Short-Form-36 (SF-36; Stewart and Ware 1992; Ware 1993): The SF-36 measures behavior-related functioning and subjective well-being (36 items; 8 subscales). A German psychometrically tested version was used for the present investigation (Bullinger 1995b).

Table 1 Demographic characteristics

non-clinical sample (*n* = 479)

age (years)	mean	range	standard deviation		
	28.95	17–72	11.82		
gender	male	female	missing		
	55.5%	44.1%	0.04%		
education	13 years	10 years	9 years	< 9 years	missing
	71.2%	11.9%	13.2%	2.9%	0.8%
net income (DM/mo)	< 1500	1500–3000	> 3000	missing	
	50.5%	16.3%	12.7%	20.5%	
marital status	single	separated/widowed/divorced	married	missing	
	53.2%	2.7%	43.0%	1.0%	

depressed sample (*n* = 171)

age (years)	mean	range	standard deviation		
	47.00	19–73	12.50		
gender	male	female	missing		
	42.7%	57.3%	0.0%		
education	13 years	10 years	9 years	< 9 years	missing
	18.7%	31.0%	43.3%	7.0%	0.0%
net income (DM/mo)	< 1500	1500–3000	> 3000	missing	
	39.8%	29.2%	15.8%	15.2%	
marital status	single	separated/widowed/divorced	married	missing	
	12.9%	16.3%	69.0%	1.8%	

schizophrenic sample (*n* = 139)

age (years)	mean	range	standard deviation		
	37.01	17–72	12.50		
gender	male	female	missing		
	43.9%	56.1%	0.0%		
education	13 years	10 years	9 years	< 9 years	missing
	42.4%	30.2%	22.3%	5.0%	0.0%
net income (DM/mo)	< 1500	1500–3000	> 3000	missing	
	41.0%	25.9%	5.0%	28.1%	
marital status	single	separated/widowed/divorced	married	missing	
	53.2%	18.7%	25.9%	2.2%	

4. Questionnaire for the State of Health (QSH; ESCAPE 1994): The QSH is a QoL inventory developed in several European languages by the "European Standardized Computerized Assessment Procedure for the Evaluation and Rehabilitation of Brain-Damaged Patients (ESCAPE)" within the European Union project BIOMED I for brain-damaged patients (63 items; 10 subscales).

5. Fragebogen Alltagsleben (Questionnaire for Everyday-living; ALLTAG; Bullinger et al. 1993): This German questionnaire measures the four QoL components physical, psychological, social and everyday functioning (39 items; 4 subscales).

6. Psychological General Well-Being Schedule (PGWBS; Dupuy 1984): The PGWBS is an instrument for the assessment of subjective well-being and discomfort (22 items; 6 subscales). A forward-backward German translation version was used in the present study (Bullinger 1995a).

7. Quality of Life Questionnaire (QLQ; Steinmeyer et al. 1996): This is a pure satisfaction questionnaire composed of the best items from the popular studies of Andrews and Withey (1978) and Campbell, Converse and Rodgers (1976; 32 items; 2 subscales).

8. Lancaster Quality of Life Profile (LQLP; Lehman, 1988; Oliver, 1991): The LQLP was developed for chronically mentally ill patients in community care settings. It assesses objective conditions and subjective satisfaction (81 items). For the present study a German version translated at the Free University Berlin (Kaiser et al. 1996) and modified at Innsbruck university hospital (Kemmler, personal communication) was used.

While subjects of the non-clinical sample filled out all eight questionnaires, two instruments were not considered for the clinical groups to avoid patient overload. The QSH and the PGWBS were cancelled for the psychopathological groups, because the former has not been sufficiently investigated yet, and the latter has revealed ambivalent validation results (Bullinger et al. 1991; Gross 1991). Moreover, the subjective well-being perspective covered by the PGWBS is also included in many other instruments (such as SF-36, QLQ or LQLP). The time-frame for all instruments was set to the last four weeks. Sequential effects were controlled by incomplete interindividual balancing (each questionnaire was applied with nearly the same frequency at any of eight resp. six possible positions). An ANOVA was performed with the sequence (8 resp. 6) as the independent variable and different sum scores of the QoL questionnaires as the dependent variables. Post hoc Tukey tests (adjusted a = 5%; homogenous variances) for all possible pair-wise comparisons revealed no significant sequential effects for all three samples.

Methods

The item pool established by the 8 questionnaires was reduced by comprehensive selection criteria from 447 to 49 items. The following psychometric properties were investigated for each individual instrument: item difficulty, face validity, item-scale-correlation corrected for overlap (item convergent validity), item discriminant validity (correlation with other scales in comparison to corrected correlation with own scale), success rates (deviations from

Fig. 1 Mapping sentence for the construct Quality of Life

The self-rating of Quality of Life by a	P. PERSON		
	[healthy	p_1]	person (X) in
	[depressed	p_2]	
	[schizophrenic	p_3]	

B. SIGNIFICANCE			A. DIMENSIONS	
[central	b_1] areas		[unspecific	a_1]
[secondary	b_2] of life		[health	a_2]
[peripheral	b_3]		[vitality	a_3]
			[psychosocial	a_4]
			[material resources	a_5]
			[emotion / affect	a_6]
			[spare time	a_7]

	R. RESPONSE	
====➔	[very positive	r_1]
	[...	r_i]
	[very negative	r_n]

discriminant validity relative to the total number of item-scale comparisons; see Ware, 1993), retest reliability, internal consistency, principal component analysis and facet analysis. The aim of this first selection was to eliminate multimorbid items (i.e., items, that do not fulfill at least half of these criteria). These results for the individual instruments cannot be presented here because of the vast volume of data (for more details see Pukrop 1997a). The emphasis in the present paper lies on the construct validation of QoL with the help of the selected 49 items that were widely spread over the 8 questionnaires (see Table 2, item source). To follow a confirmatory approach, a non-parametric similarity structure analysis within a faceanalytical framework was performed (Borg and Shye 1995; Canter 1985; Guttman 1977; Shye 1978, 1993).

The calculated similarity matrix (similarity measures between the preselected items of all questionnaires) for the confirmatory similarity analysis is based on the monotonicity coefficient μ2 (Guttman 1977; Staufenbiel 1987). This coefficient is very robust concerning the distribution of raw scores, it need not be corrected for ties, and its size does not depend on metric qualities of variables. With the help of non-metric multidimensional scaling techniques (MDS), the empirical similarities are transferred into spatial distances (Borg and Lingoes 1987). High empirical similarities correspond to small spatial distances, and small coefficients correspond to large spatial distances within the graphic representation.

Having represented relationships between items spatially by MDS, predictions are made about the regional configuration of points (i.e., items) within that (two-dimensional) space. In facet analysis these predictions are stated in the form of a correspondence hypothesis between a mapping sentence (a definitional system; see Fig. 1) and the empirical MDS solution (Borg and Shye 1995; Levy and Guttman 1975). In the case of QoL items semantic relationships are defined formally within the mapping sentence in the form of facets, which can be interpreted as design factors partitioning the two-dimensional space according to a nominal and an ordinal principle. The two principles together form the spatial hypothesis of a radex.

The mapping sentence in Fig. 1 can be inferred from facet analyses of the single questionnaires in the non-clinical sample (not presented here; see Pukrop 1997a) for the subsequent confirmatory tests. This mapping sentence defines the populations of persons, contents (stimuli) and responses to which QoL can be applied.

Person facet P contains three elements (healthy, depressed and schizophrenic persons). The first content facet A structures the construct QoL according to life areas (dimensions, components will be used as synonyms) with the elements "General QoL" (a_1), "Health-related QoL" (a_2), "Vitality" (a_3), "Psychosocial QoL" (a_4), "Material QoL" (a_5), "Emotional QoL" (a_6) and "Spare time QoL" (a_7). Because these elements cannot be ordered in any way, they form a nominal facet. The second content facet B hypothesizes an ordered principle according to the subjectively experienced significance of those life areas. It contains the elements "central" (b_1), "secondary" (b_2) and "peripheral" (b_3). The range of

response facet R is ordered from "very positive" (e.g., very satisfied) to "very negative" (e.g., very dissatisfied). Items scaled like this can be characterized as attitude items (Levy 1985). This implies the first law of attitude that can be tested empirically. It is hypothesized that all items are positively or at least not negatively intercorrelated (correlations up to -0.10 can be tolerated as noise), because they all refer to the same object (an attitude towards one's own life). This is well known from intelligence tests whose items correlate positively with each other (Spearman 1927; Thurstone 1935).

With the help of the mapping sentence the 49 items from the different questionnaires can be defined in relation to their hypothesized region within the empirical spatial configuration. For example, the item *"In general, what would you say your health is?"* from SF-36 is linked by definition to the combination of facet elements (structuple) a_2 (health dimension) and b_3 (peripheral significance). The defined a priori assignment of the 49 items remaining in the pool to facet elements and structuples is given in Table 2.

The goodness of fit (that is the amount of correspondence between the item pool hypothetically structured by the mapping sentence and the empirical configuration calculated by MDS) can be quantified by a separation index varying between 0 and 1 (the 1 indicating a perfect solution). Moreover, sensitivity (proportion of correctly classified items in relation to the number of expected items) and specificity (proportion of correctly classified items in relation to the total number of items within one region) can be determined. Both indices should be at least 80%. Facet analyses will be performed for all three samples and in order to test stability for six subsamples of the non-clinical group. Two or more empirical configurations can be compared quantitatively by calculating the proportion of common variances over the point coordinates (Procrustean Individual Difference Scaling; PINDIS; Borg and Lingoes 1987; Lingoes and Borg 1977).

Items of one region can be aggregated into a sum score that can be tested for psychometric criteria such as internal consistency (at least 0.70), retest reliability, item convergent validity (at least 0.40) and item discriminant validity. Therefore it is necessary to transform raw scores of items with different scaling by plain transformation to obtain equivalents for z-values of a standard normal distribution (a simple linear z-transformation would lead to severe distortions; Lienert 1989). Stanine-norms of the plain-transformed z-scores can be taken to calculate the psychometric values (Stanine = 5 + 1.96 z).

Results

Concerning the first law of attitude there is only one correlation (out of 1081) that is less than -0.10 in the non-clinical sample. The (idealized) empirical structure with the radex hypothesis for the non-clinical sample and the

Table 2 Item-structuple assignment for the core module

item no.	structuple	region	item content	item source
5	a_1-b_1	GENERAL	enjoying life	ALLTAG
3	a_1-b_1	QoL	wake up depressed	NHP
11	a_1-b_1		hopeless future	QSH
16	a_1-b_1		worthlessness	QSH
18	a_1-b_1		problems in general	QSH
36	a_1-b_1		feeling in general	PGWBS
34	a_1-b_1		mental health	LQLP
35	a_1-b_1		life in general	LQLP
32	a_2-b_3	HEALTH-RELATED	physical problems	LQLP
33	a_2-b_3	QoL	satisfied with health	LQLP
19	a_2-b_3		general health	SF-36
20	a_2-b_3		vigorous activities	SF-36
21	a_2-b_3		moderate activities	SF-36
22	a_2-b_3		lifting groceries	SF-36
23	a_2-b_3		time on activities	SF-36
4	a_3-b_2	VITALITY	sleeping until fresh	ALLTAG
6	a_3-b_2		feeling comfortable	ALLTAG
7	a_3-b_2		physical appearance	ALLTAG
2	a_3-b_2		sleep badly	NHP
24	a_3-b_2		full of pep	SF-36
27	a_3-b_2		tired	SF-36
26	a_3-b_2		lot of energy	SF-36
46	a_3-b_2		satisfied with sleep	QLQ
48	a_3-b_2		physical condition	QLQ
8	a_4-b_2	PSYCHOSOCIAL	make one's way	ALLTAG
9	a_4-b_2	QoL	living up to expectation	ALLTAG
10	a_4-b_2		self-confident	ALLTAG
1	a_4-b_2		lonely	NHP
31	a_4-b_2		relations with others	LQLP
44	a_4-b_2		acceptance by others	QLQ
45	a_4-b_2		decision making	QLQ
47	a_4-b_2		satisfied with friends	QLQ
49	a_4-b_2		self-respect	QLQ
29	a_5-b_3	MATERIAL	finances	LQLP
30	a_5-b_3	QoL	living conditions	LQLP
42	a_5-b_3		standard of living	QLQ
43	a_5-b_3		place of residence	QLQ
12	a_6-b_2	EMOTIONAL	temper outbursts	QSH
13	a_6-b_2	QoL	easily hurt	QSH
15	a_6-b_2		getting into quarrels	QSH
37	a_6-b_2		under pressure	PGWBS
38	a_6-b_2		active/dull	PGWBS
39	a_6-b_2		worried	PGWBS
40	a_6-b_2		relaxed	PGWBS
41	a_6-b_2		stress	PGWBS
25	a_6-b_2		nervous	SF-36
14	a_7-b_2	SPARE TIME	hobbies at home	QSH
17	a_7-b_2	QoL	hobbies outside	QSH
28	a_7-b_2		satisfied with spare time	LQLP

49 variables of the core module is presented in Fig. 2. Sensitivity as well as specificity of the nominal (polarizing) facet A is 100% for almost any region (separation index 0.97 with 2% misclassifications). The LQLP item *spare time satisfaction* is the only error, because it is not localized in the spare time region but in the vitality region. Therefore the spare time region has a sensitivity of 67% and the vitality region has a specificity of 90% (see Table 3). The ordered (modularizing) facet B has a separation index of 0.99 with 4% misclassifications.

In addition, the configuration of points in the healthy sample remains stable in five of the six subsamples (per-

sons with even and odd numbers, females, persons with family, employed persons; see Table 3). Only the male subsample deviates from this consistent structure.

Internal consistency (Cronbach´s α), retest reliability, item convergent validity and item discriminant validity are presented in Table 4. Sum scores included in the calculations are made up of the items belonging to a particular region according to the elements of facet A.

The following peculiar features have to be considered for the clinical samples: Because PGWBS and QSH have not been applied to the depressed and schizophrenics, only the arrangement of 33 variables that were measured
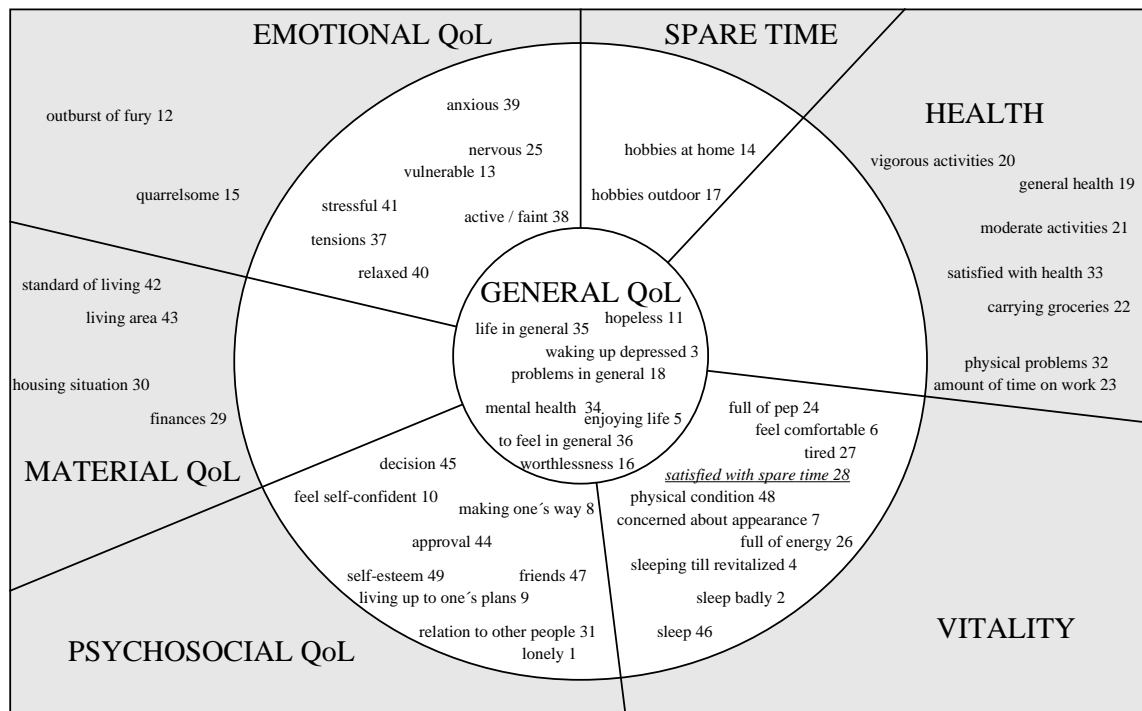
Fig. 2 Empirical structure with radex hypothesis (non-clinical sample)

The item no. correspond to Table 2. Underlined and in italics = misclassifications.

in all three samples can be compared (see Figs. 3 and 4). As a result, the areas "General QoL" (4 instead of 8 items) and "Emotional QoL" (1 instead of 9 items) are insufficiently represented. Moreover, the spare time component has been omitted.

Results of the confirmatory test of the relationships described in Fig. 1 (the mapping sentence) and Table 2 for the depressed sample are presented in Fig. 3 and Table 3. Six misclassifications (82% correctly classified items) and a separation index of 0.92 indicate that the structure of the core module postulated for the non-clinical sample can also be validly replicated for depressed patients. In addition, the first law of attitude is fulfilled because there are no negative correlations smaller than -0.10. The order of sections within the circular arrangement of the radex (health, vitality, psychosocial, material and the central position of general QoL) is identical to that within the healthy sample.

Results of the confirmatory test of the relationships described in Fig. 1 and Table 2 for the schizophrenic sample

Table 3 Goodness of fit for different healthy subsamples and for the clinical samples

REGION		general	health	vitality	psycho-social	resour-ces	emo-tional	spare time	% correct	sepa-ration
total (n = 479)	sensitive	100%	100%	100%	100%	100%	100%	67%	98%	0.97
	specific	100%	100%	90%	100%	100%	100%	100%		
"even" pbn (n = 239)	sensitive	88%	100%	89%	100%	100%	100%	100%	96%	0.93
	specific	100%	88%	100%	100%	100%	100%	75%		
"odd" pbn (n = 240)	sensitive	88%	100%	100%	100%	100%	100%	33%	94%	0.90
	specific	100%	100%	90%	90%	100%	100%	100%		
female (n = 211)	sensitive	100%	100%	100%	100%	100%	88%	67%	96%	0.94
	specific	89%	100%	90%	100%	100%	100%	100%		
male (n = 266)	sensitive	100%	100%	44%	78%	100%	44%	33%	71%	0.83
	specific	100%	88%	67%	58%	80%	80%	20%		
pbn with family (n = 206)	sensitive	88%	100%	89%	100%	100%	100%	33%	92%	0.93
	specific	100%	88%	89%	100%	100%	82%	100%		
employed pbn (n = 372)	sensitive	100%	100%	100%	100%	100%	100%	67%	98%	0.97
	specific	100%	100%	90%	100%	100%	100%	100%		
depressed (n = 171)	sensitive	75%	86%	88%	67%	100%			82%	0.92
	specific	100%	100%	88%	86%	100%				
schizophrenic (n = 139)	sensitive	75%	86%	100%	78%	100%			85%	0.74
	specific	100%	88%	67%	88%	100%				

Table 4 Item and scale values for the core module (healthy sample)

LIFE AREA	internal consistency	retest reliability	item no.	item-scale correlation	health	vitality	psycho-social	resources	affect	spare time
GENERAL	0.87	0.78	5	0.63						
			11	0.52						
			16	0.52						
			18	0.59						
			34	0.71						
			35	0.69						
			3	*0.39*						
			36	0.66						
HEALTH	0.79	0.71	32	0.45	–	0.24	0.14	0.12	0.19	0.15
			33	0.68	–	0.52	0.35	0.22	0.38	0.32
			19	0.69	–	0.54	0.30	0.20	0.37	0.32
			20	0.55	–	0.33	0.14	0.05	0.29	0.27
			21	0.40	–	0.28	0.10	0.00	0.24	0.24
			22	*0.35*	–	0.25	0.09	0.01	0.18	0.21
			23	0.41	–	0.28	0.08	0.05	0.24	0.23
VITALITY	0.83	0.64	4	0.60	0.30	–	0.41	0.25	0.38	0.30
			6	0.55	0.29	–	0.55	0.33	0.48	0.40
			7	0.44	0.28	–	*0.48*	0.22	0.32	0.32
			46	0.60	0.30	–	0.43	0.31	0.37	0.29
			48	0.50	*0.63*	–	0.46	0.29	0.38	0.29
			2	0.40	0.28	–	0.27	0.16	0.32	0.24
			24	0.60	0.40	–	0.54	0.29	0.50	0.42
			26	0.59	0.43	–	0.52	0.27	0.48	0.37
			27	0.50	0.31	–	0.36	0.20	0.41	0.33
PSYCHOSOCIAL	0.87	0.71	8	0.60	0.24	0.51	–	0.25	0.36	0.31
			9	0.66	0.27	0.59	–	0.40	0.50	0.38
			10	0.66	0.25	0.55	–	0.24	0.51	0.29
			44	0.57	0.24	0.46	–	0.41	0.41	0.35
			45	0.64	0.17	0.49	–	0.34	0.38	0.23
			47	0.61	0.23	0.46	–	0.30	0.40	0.37
			49	0.72	0.23	0.55	–	0.36	0.48	0.30
			31	0.55	0.27	0.40	–	0.29	0.36	0.33
			1	0.42	0.15	0.34	–	0.26	0.35	0.23
MATERIAL RESOURCES	0.73	0.81	42	0.54	0.18	0.39	0.42	–	0.29	0.23
			43	0.52	0.15	0.34	0.43	–	0.25	0.20
			29	0.43	0.16	0.22	0.26	–	0.19	0.16
			30	0.57	0.14	0.31	0.30	–	0.24	0.21
AFFECT	0.83	0.72	12	*0.36*	0.15	0.24	0.22	0.15	–	0.25
			13	0.50	0.28	0.37	0.40	0.14	–	0.36
			15	*0.39*	0.22	0.28	0.29	0.15	–	0.26
			37	0.64	0.25	0.42	0.43	0.17	–	0.34
			38	0.51	0.38	*0.60*	0.50	0.21	–	0.42
			39	0.64	0.28	0.44	0.44	0.25	–	0.31
			40	0.69	0.31	0.53	0.44	0.26	–	0.40
			41	0.55	0.21	0.42	0.38	0.27	–	0.37
			25	0.53	0.24	0.38	0.32	0.27	–	0.36
SPARE TIME	0.69	0.39	14	0.48	0.27	0.38	0.28	0.11	0.41	–
			17	0.53	0.23	0.40	0.36	0.20	0.44	–
			28	*0.37*	0.31	*0.41*	0.37	0.26	*0.41*	–
TOTAL	0.87	0.72								

Deviations according to item-total correlation corrected for overlap and to discriminant validity have been boldtyped and in italics

are presented in Fig. 4 and Table 3. Although there are only five misclassifications (85% correctly classified items), a separation index of 0.74 indicates that the exact partitioning is less precise. The first law of attitude is violated by only three correlations (out of 528). The order of sections within the circular arrangement of the radex (health, vitality, psychosocial, material and the central po-

sition of general QoL) is again identical to that within the healthy and the depressed samples. The common proportion of variance calculated by PINDIS over the point coordinates of all three configurations is 95%.
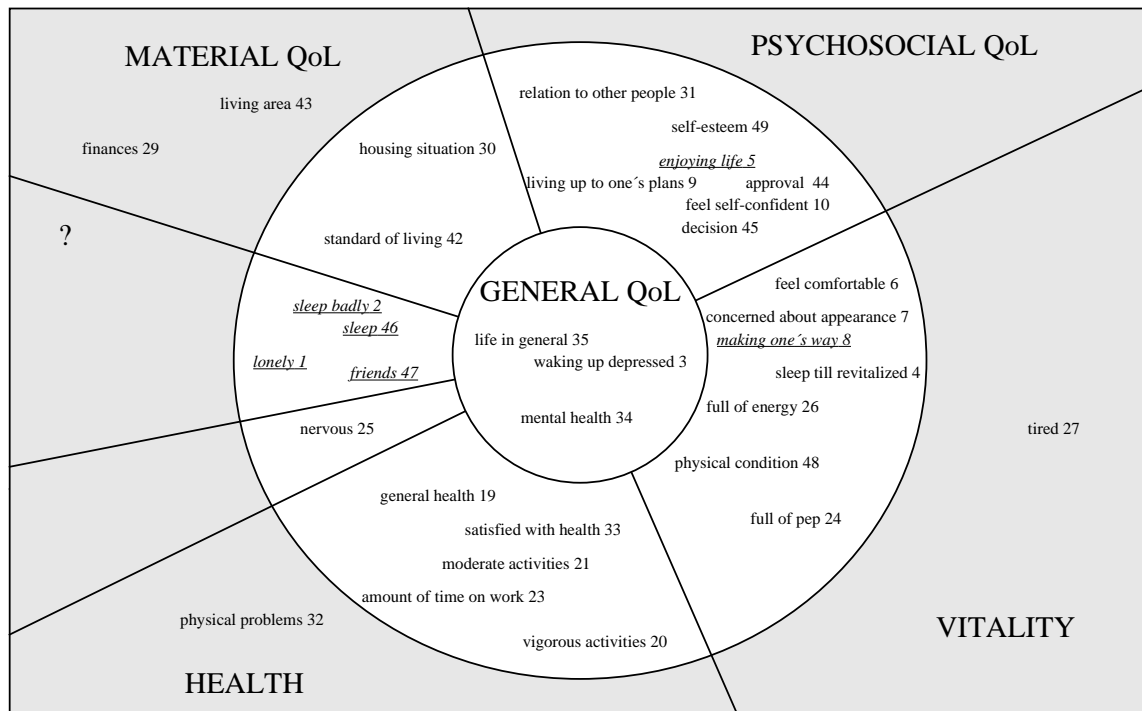
Fig. 3 Empirical structure with radex hypothesis (depressed sample)

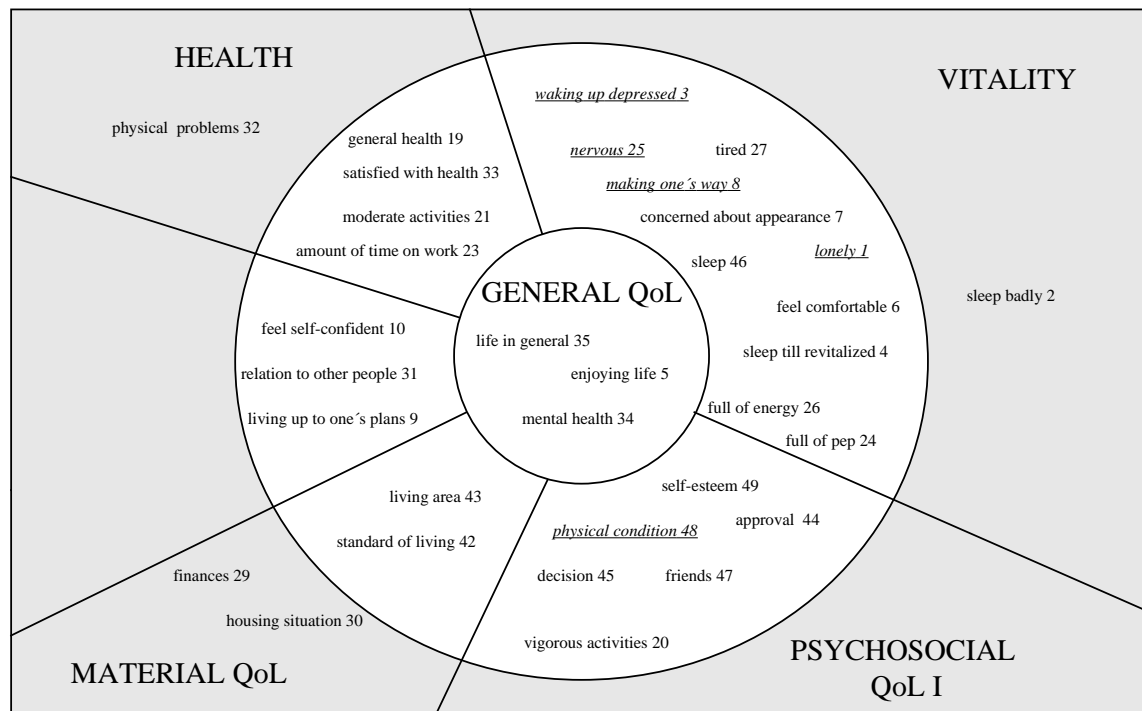The item no. correspond to Table 2. Underlined and in italics = misclassifications.

Fig. 4 Empirical structure with radex hypothesis (schizophrenic sample)

The item no. correspond to Table 2. Underlined and in italics = misclassifications.

Discussion

Non-clinical sample

In the center of the radex configuration for the non-clinical sample (Fig. 2) there are only life areas that refer either to general well-being (e.g., *enjoying life; satisfaction with life in general*) or to general "ill-being" in the sense of a depressed mood (e.g., *worthlessness; hopeless about the future*). The eight items can be aggregated into a score labeled "general well-being" or "general QoL" from depressed to happy or satisfied. The existence of such a "G-factor" is supported by a number of other investigations concerning the internal structure of QoL (Andrews and Withey 1978; Diener 1984; Larsen et al. 1985; Stones and Kozma 1985) and by findings of high negative correlations of up to 0.86 between well-being (or subjective QoL) and depression (Abbey and Andrews 1985; Dupuy 1984; Lewinsohn et al. 1991; McKenna and Hunt 1992; Waltz 1986). Thus, it is justified to ask if the subjective experience of depressive feelings and cognition is the same as the subjective experience and evaluation of one's life in general. This would imply that depression self-inventories often can do the same job as subjective QoL measures. QoL might be more comprehensive than depression, but the core of QoL would be caught by a depression inventory.

In addition to this central region there are at least six more sections of different direction away from the center. These sections together form a circumplex gathering around the common origin of "General QoL". The first region can be identified as "physical health" or "health-related QoL" (e.g., *general health; amount of time spent on activities*). This QoL component is measured using seven items ranging from limited to excellent health. This makes sense because health can be limited for a smaller time interval or with a lower intensity even within a more or less healthy group.

After that a region "physical vitality" in the sense of a subjective estimation of physical fitness from exhausted and tired to full of energy and vitality (nine items) can be established.

The third region can be understood as "self-actualization within a social context" or "psychosocial QoL". This contains items referring to feelings of self-confidence and to self-confident behavior within social interactions (e.g., *living up to one´s expectations; acceptance of one´s performance by others*). These nine items can be summed up to the QoL component "psychosocial QoL" from socially integrated and accepted to lack of self-confidence and rejection.

The fourth region contains "material QoL" *(satisfaction with financial resources and resources for living)*. This component from materially satisfied to materially dissatisfied is measured using four items.

The section "psychological stress/mental health" or "emotional QoL" from stressed and worried to relaxed and easy-going is measured using nine items (e.g., *under pressure; stress and burden; get easily into quarrels*). This component is not intended to assess short-term mood, but medium-term stabilized positive and negative affects.

Finally, we can establish a separate spare time region from active, satisfying leisure to unsatisfied withdrawal from leisure activities. Because leisure has many relationships to other superordinate life areas (such as physical, social and mental QoL), it cannot be definitely subsumed under another higher order concept. Therefore, it seems appropriate to postulate a separate region for it.

Concerning the criterion of content validity most authors recommend four basic QoL dimensions: Mental, physical, social and everyday living/role functioning QoL (Spilker 1990; Spitzer 1987; Ware 1987; Wenger et al. 1984). The fourth dimension often comprises very different areas of life (such as role functioning or material resources). In addition, they postulate an unspecific component of general well-being. The core module of the "Modular System for QoL" (MSQoL) contains two physical areas (health and vitality), two mental areas (emotional and psychosocial QoL) and a material area (material QoL) in addition to a central region of general QoL in the sense of a "G-factor". The social dimension of QoL is represented in two ways: First it is integrated into the psychosocial component, since psychological and social features are interrelated and can no longer be distinguished within a subjective QoL construct. Stewart (1992) describes a similar model in which physical and mental components are postulated as theoretical dimensions, and social well-being (among others) functions as an indicator for these dimensions. Second, the familiar social areas such as partnership and family are included in the form of two additional modules with four and three items because they refer to subpopulations and therefore cannot be integrated into the core module. These two specific modules have been generated from psychometric and similarity structure analyses in persons with partner and family not reported here (Pukrop 1997 a).

The correspondence of the empirical configuration with the three elements of the modularizing facet B can be understood as follows: The items measuring general well-being are per definition of central significance for the QoL in this population. All other life areas are of secondary impact. "Physical Health" and "Material Resources" constitute the only exceptions being of peripheral significance for QoL in a population that is more or less healthy and materially well provided for. Health in particular has been shown to be of peripheral significance by means of regression analysis in many other studies (e.g., Andrews and Withey 1978; Campbell et al. 1976; Larson 1978). It should be emphasized that these results do not depend on explicit ratings of significance, but on the interrelationships of items structured by the ordinal facet B.

Evaluating the psychometric properties of the items and scales, it has to be noticed that all subscales of the MSQoL fulfill the lower reliability limit of 0.70 (median internal consistency 0.83). Only the spare time score falls slightly beyond this criterion. Retest reliabilities are about

0.10 lower, because they contain real changes (range 0.64 to 0.81; median 0.72). Retest values are lower than internal consistencies for the components vitality and psychosocial QoL, whereas the opposite is true for the more heterogenous material QoL (financial and living conditions). The criterion of item-total correlation corrected for overlap (at least 0.40) is narrowly missed by four items (no 3, 12, 15, 22) from three different scales. However, all four items show higher item-total correlations than correlations with other subscales (criterion of item discriminant validity). The only exception is the problematic LQLP item *satisfied with spare time* from the leisure region, which neither fulfills the criterion for item-total correlation nor for item discriminant validity. Minor limitations on the latter criterion are produced by two more items (no. 7 and 38). However, a clear violation results for the QLQ item *satisfaction with physical condition*, which correlates higher with the health scale (0.63) than with its own vitality scale (0.50). Because this item is located in all facet analyses very close to the health region and can be substantially assigned to the latter one without any disadvantages, this feedback from the empirical data should lead to a corresponding change in the definitional system (and in the final version of the questionnaire). Discriminant validities cannot be determined for the central items of general well-being, because they overlap with all other items by definition. Success rates range between 96% and 100%. The only exception is again the leisure dimension with a rate of 87%.

The result of the analysis of the non-clinical subgroup is a questionnaire with a core module of QoL and specific modules for persons with a partner, a family and a job (the analyses of the specific modules are not reported here; see Pukrop 1997a; 1997b). The internal structure of the core module with the QoL components general QoL, physical QoL (health and vitality), psychosocial QoL, material satisfaction, emotional QoL and leisure time QoL can be evaluated as valid independent of the particular QoL instruments used. In addition, the MSQoL should be supplemented by a demographic module, although the reliable finding of negligible relationships between those variables and QoL could also be confirmed for the current sample (the demographic variables age, gender, education and income together explained a non-significant proportion of 5% of the central QoL score).

Three modifications of the definitional system must be considered for the final version: The items *leisure time satisfaction* (LQLP) and *lifting groceries* (SF-36) fail to fulfill different criteria and were therefore removed from the module (so the number of items is reduced from 49 to 47). In addition, the QLQ-item *satisfied with physical condition* has been assigned to the health section instead of the vitality region.

Clinical samples

The next task is to test if the set of 47 variables of the core module that have been chosen for the healthy group is also valid for the psychopathological samples according to the mapping sentence in Fig. 1. Because PGWBS and QSH were not applied to the depressed and the schizophrenic sample, only the configuration of the 33 variables that were measured in all three samples can be compared (Figs. 3 and 4).

The structure postulated for the non-clinical group can be clearly replicated for the depressed sample. Although the specificity of the partitioning is sufficient for all regions, there are some limitations for sensitivity for the components general QoL and psychosocial QoL. The general QoL region is only represented by four items (compared to eight items in the non-clinical group) and has a sensitivity of 75%. However, this is of no critical value, because three of four items are correctly located in the center. Thus, this deficit might be compensated for by completing the scale with the missing items.

The only critical region from which more than one item cannot be classified correctly is the psychosocial area. Even for this component only two items are misclassified according to the definitional system: QLQ *(satisfaction with friends)* and NHP *(feeling lonely)*. Both items are localized within a heterogenous region that contains four of all six misclassifications. In addition, the arrangement of regions within the radex of the depressed sample is identical with the order within the radex for the non-clinical group.

The replication of the postulated structure for the schizophrenic group can only be partially confirmed. Although all regions apart from the broad vitality area can be reproduced specifically, sensitivity is limited for general QoL and psychosocial QoL as in the depressed group. Because sensitivity of the center region is lowered to 75% again by the misclassification of only one item (NHP-*wake up depressed*), it will be clearly improved by the addition of the remaining four items in this region.

Again, the only difficult section is the psychosocial component. While the items ALLTAG *(make one´s way)* and NHP *(feeling lonely)* are localized in the vitality region, the most significant deviation from the other solutions is that the psychosocial component breaks into two parts. This split is also primarily responsible for the low separation coefficient. There may be a systematic explanation for this break in half, since one part the QLQ satisfaction items are in and mainly ALLTAG items are in the other. This could suggest a methodological artifact. The arrangement of regions within the radex is again identical to the order in the non-clinical and in the depressed group. Because the majority of criteria are met (first law of attitude, specificity, sensitivity except psychosocial QoL, order of regions), the application of the core module to a schizophrenic population can be recommended.

Facet B has not been investigated further for the clinical samples apart from a dichotomization in central and peripheral areas. However, there is another strong indicator of the similarity between the three structures: A common proportion of variance of 95% also indicates a strong similarity between the subjectively construed QoL in non-pathological, depressed and schizophrenic populations. It

can be argued that the group of mentally healthy persons has very atypical living conditions because of containing mainly students and that the schizophrenic and depressed patients have different anchors for their QoL judgements because of their institutionalization. However, despite these different living conditions the subjective construction of QoL could be shown to have a very similar structure. This is not true, of course, for the QoL profile (the mean scale scores), which is very dissimilar for the three groups. It must be emphasized that the radex solutions are based on the relative sizes of similarity coefficients. Such a structure is very robust and hardly influenced by sampling error. The absolute sizes which are used for calculating factor analyses, for example, are much more dependent on sample characteristics.

In order to identify specific modules for a particular group, whatever the reported similarities the items of those scales have been further investigated using facet analysis, which showed significant mean differences between the three groups. Apart from a cognitive module that can be integrated for both schizophrenic and depressed patients, no special dimensions could be identified that go beyond the core module. It might be possible to interpret the main regional deviations (the "question mark" region in the depressed sample and the split of the psychosocial region in the schizophrenic sample) as specific for the actual diagnostic subgroups. If specific scales or items for a particular population are suggested in other QoL studies, these specific features refer to distinct functional physical deficits. Basic areas of life that have an appropriate idiographic meaning (like for wheelchair drivers or patients with carcinoma) do not necessarily emerge for psychiatric patients. Another explanation may be that the aspects covered by the item pool applied in the present study are not specific enough.

Conclusions

The intention of the present study was to contribute to the validation of QoL in psychiatric populations. It was argued that there is no such valid construct in the face of the vast number of heterogenous measurement instruments and the lack of a comprehensive theory for QoL. Summarizing the results, the validity of a core module for QoL subjectively construed by healthy, depressed and schizophrenic persons can be argued for all three populations with minor limitations. The core module suggested here is composed of items from different questionnaires leaving out redundancies and including particuliarities of the single assessment tools. Thus, the intention was not to describe the QoL of psychiatric patients (i.e., their QoL profile) which would require an already validated construct QoL agreed upon in the relevant literature. Because only if reality is construed in similar ways it makes sense to search for quantitative differences (evaluative, predictive and discriminative purposes). The complex transformation process of raw data within the present study suggests postponing the investigation of quantitative profiles to future studies in which all items have the same response range (seven steps in MSQoL). This will also allow for testing the complete questionnaire with 47 items, because the omission of emotional and spare time QoL is a restriction in the present data.

The MSQoL is an integration of eight (inter)nationally established QoL instruments. The aim of the present study is not so much on presenting just another QoL questionnaire but more on comparing and integrating instruments already existing to stop the process of diffusing the concept. Results of this integration process can also be used for a thorough discussion of existing QoL instruments concerning strengths and limitations, especially for psychiatric patients.

The extract of a mapping sentence can be understood as a cumulative research design by adding or cancelling single items, facet elements or whole facets depending on their theoretical and/or empirical foundation. Spitzer (1987), for example, states that it is essential to modify general instruments according to specific settings and investigations (or even individuals). Such idiographic elements can be added to the MSQoL to make intraindividual (or intrainstitutional) comparisons, and the universally valid modules can be applied to compare different settings and populations with each other.

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