Psychometric Properties of the Borderline Symptom List (BSL)

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Abstract

Background: The Borderline Symptom List (BSL) was developed as a self-rating instrument to specifically quantify borderline-typical symptomatology. The items are based on the criteria of the DSM-IV, the Diagnostic Interview for Borderline Personality Disorder – revised version, the opinions of clinical experts and borderline patients. The psychometric properties and validity of the BSL have been investigated in several studies. **Sampling and Methods:** A total of 380 borderline patients and 204 healthy controls scored the items. A factor analysis of the BSL items suggests the following subscales: 'self-perception', 'affect regulation', 'self-destruction', 'dysphoria', 'loneliness', 'intrusions' and 'hostility'. **Results:** The internal reliability as well as the test-retest reliability within 1 week are high. Different aspects of validity (e.g. comparison between groups) provide favorable results. Prepost comparisons after 3 months of dialectical behavioral treatment reveal a significant reduction of the total score and of 5 of the 7 subscales. **Conclusions:** This indicates that the BSL is sensitive to therapeutically induced change of borderline-typical impairment.   Copyright © 2007 S. Karger AG, Basel

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Introduction

Borderline personality disorder (BPD) is a serious mental disorder with a characteristic pattern of instability in affect regulation, impulse control, interpersonal relationships and self-perception. BPD affects approximately 1.5% of the general population, 11% of psychiatric outpatients and up to 20% of inpatients [1]. BPD is characterized by severe psychosocial impairments [2] and a high mortality rate due to suicide: up to 10% of patients commit suicide, giving a rate almost 50 times higher than that in the general population [3]. Because of substantial treatment utilization there are few psychiatric patient groups requiring more mental health resources than patients with BPD do [4, 5]. Currently the categorical diagnostic assessment is based on structured clinical interviews such as the Diagnostic Interview for DSM-IV Personality Disorders [6], the International Personality Disorder Examination (IPDE) [7], the Structured Clini-

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cal Interview for DSM-IV Axis II Personality Disorders [8] or the Structured Interview for DSM-IV Personality (SIDP) [9]. The reliabilities for BPD diagnosis were sufficient to excellent ($\kappa = 0.68–0.96$ for interrater and 0.40–0.85 for test-retest reliabilities, respectively) [10].

In addition to these DSM-based instruments, a number of instruments designed to specifically assess BPD have been developed in recent years. The current international scientific standard is the Diagnostic Interview for BPD – revised version (DIB-R) [11]. Further interviews and external assessments are: the Schedule for Interviewing Borderlines by Baron [12], the Borderline Personality Disorder Scale (BPDS) by Perry [13] as well as the Structural Interview by Kernberg [14]. The best known self-report instrument is the Borderline Syndrome Index [15].

These instruments were primarily developed for the categorical diagnosis of BPD. Dimensional instruments for the assessment of the severity of or change in borderline psychopathology were lacking until recently: Zanarini [16] published a DSM-based clinician-administered scale providing promising psychometric properties. Arntz et al. [17] developed the Borderline Personality Disorder Severity Index, also a structured interview with good psychometric properties, which seems suitable for treatment research.

We developed the Borderline Symptom List (BSL), the first self-report procedure to quantitatively assess specific complaints, i.e. subjective impairments of patients with BPD. The construction of the scale has since been published in German [18]. The current article summarizes the results on the validity and reliability as well as initial data on the sensitivity to change.

Methods

Participants
The results reported in this article are based on 6 different samples.

(1) The analysis of the scale structure is based on a sample of 308 female patients aged from 17 to 56 years (mean = 30) who met the DSM-IV criteria for BPD. The diagnosis was assessed by means of the BPD segments of the IPDE [7]. Of the participants 76% were inpatients, and 24% were in outpatient treatment. The patients were recruited in 68 psychiatric hospitals and 5 psychotherapeutic practices. Of these 25% met 5 DSM-IV criteria, 35% met 6, 24% met 7, 12% met 8, and 5% met all 9 criteria.

(2) To test the influence of gender, we additionally administered the scale to 72 male patients who met the DSM-IV criteria for BPD (mean age 31 years, range from 18 to 58). The diagnosis was assessed by means of the BPD segments of the IPDE [7]. Of

the male BPD patients 35% met 5 DSM-IV criteria, 38% met 6, 17% met 7, 8% met 8, and 2% met 9 criteria.

(3) The questionnaire was administered to 204 healthy controls (119 females, mean age = 30 years, range from 19 to 45; 85 males, mean age = 31 years, range from 19 to 44). The healthy controls were recruited at random from the resident register of the city of Freiburg, Germany. A semistructured interview, the Mini International Neuropsychiatric Interview [19] was administered to each person. Exclusion criteria were any lifetime Axis I diagnosis, current psychotherapy, psychopharmacotherapy or first-degree relatives with mental disorders.

(4) To test the specificity of the BSL we administered the scale to 283 patients with different current Axis I diagnoses (clinically based diagnoses according to the criteria of the DSM-IV; schizophrenia: n = 51, mean age = 35 years, range from 20 to 65; major depression: n = 86, mean age = 46 years, range from 18 to 77; anxiety disorder [without obsessive-compulsive disorder (OCD)]: n = 19, mean age = 43 years, range from 20 to 63; OCD: n = 29, mean age = 41 years, range from 23 to 60).

(5) To determine the test-retest reliability, after an interval of 7 days the BSL was administered a second time to 35 females in inpatient treatment experiencing BPD (diagnoses based on the IPDE).

(6) To measure the sensitivity of the scale to change, the BSL was administered twice to 63 female borderline patients (diagnoses based on the IPDE) before and after a 3-month inpatient dialectical behavior therapy (DBT) treatment. As previously published, this treatment leads to a significant reduction of the global severity index of the Symptom Checklist SCL-90-R [20, 21].

(6a) To determine the convergent and divergent validities, additional questionnaires to measure depression (Beck Depression Inventory (BDI) [22], Hamilton Depression Scale (HAMD) [23]), anxiety (State-Trait-Anxiety Inventory (STAI) [24]), aggression (State-Trait-Anger Inventory (STAXI) [25]), dissociation (Dissociative Experiences Scale/Questionnaire on Dissociative Experiences (DES/FDS) [26]) and self-injury (Lifetime Parasuicide Count [27]) were given to a subgroup of 21 patients of sample No. 6.

(6b) A subgroup (n = 52) of sample No. 6 received the SCL-90-R [28] together with the BSL before treatment.

Instruments
BSL Scale Development
The compilation and formulation of the items followed the DSM-IV criteria and the DIB-R as described by Gunderson and Zanarini [29]. Furthermore the generation of the items was based on experiential knowledge of clinical experts and numerous statements by patients. The contextual and semantic quality of the items was tested by an expert group in cooperation with 20 female borderline patients of the University Hospital Freiburg (Germany). The aim was to compile a complete list of subjective complaints among female borderline patients. The items were formulated in a way in which they could be worked on by a group of patients with very different educational backgrounds.

The evaluation of the individual items used a 5-step Likert scale for severity, with the following possible answers: 'not at all', 'a little', 'rather', 'much' and 'very strong'. The period selected for the evaluation of the symptoms was the previous week. Thus, the scale can be used in combination with other scales that also apply a 1-week evaluation period (e.g. SCL-90-R). In order to evaluate

Table 1. Item scale allocation

Scale	Items	Sample items (highest loadings)
Self-perception	19	'paralyzed', 'petrified', 'felt cut from myself'
Affect regulation	13	'experienced stressful inner tension', 'suffered from shame', 'overwhelmed by my feelings'
Self-destruction	12	'suicidal thoughts', 'longing for death', 'fascination of death'
Dysphoria	10	'unbalanced', 'felt unfree and uneasy', 'unsatisfied'
Loneliness	12	'isolated from others', 'rejection of others', 'believed that nobody could understand me'
Intrusions	11	'felt the presence of someone who was not really there', 'tortured by images', 'had different people inside me'
Hostility	6	'angry', 'aggressive', 'irritated'

the structural validity a visual analog scale was administered at the same time. This scale assesses the global well-being ranging from 0 (very bad) to 100 (excellent).

Further Instruments
To evaluate the convergent and divergent validities of the BSL, the following instruments were administered: BDI [22], HAMD [23], FDS [26] (as the German version of the DES) [30], STAI [24], STAXI [25] and the SCL-90-R [28].

Statistical Analysis
The calculations to develop the scale were carried out by means of factor analyses (principal component analyses, varimax rotation). To test the correlation, Pearson's correlation coefficient was used if possible, otherwise Spearman's correlation coefficient was used. To test psychometric properties, detailed item analyses were carried out first, followed by calculations of estimates of reliability with regard to internal consistency (Cronbach's α). The validity was tested by means of correlation analyses, t tests and analyses of variance (ANOVA).

Results

The analyses to develop the structure of the scale were based on a sample of 308 female borderline patients. The principal component analysis yielded 22 factors with an eigenvalue >1. The scree plot suggested a 7-factor solution. Of the original 99 items 4 were eliminated due to predefined criteria (no clear assignment to a factor and factor loading on the first unrotated factor <0.3). The first unrotated factor accounted for 32% of the total variance, which legitimated the composition of a total score. Another factor analysis (principal component analysis, varimax rotation) of the reduced item pool corroborated

the 7-factor solution. Of the total variance 54% could be explained by the 7 factors.

A total of 83 items could be assigned to the 7 factors. The remaining 12 items were entered into the calculation of the total value (see comparable strategy for the SCL-90-R [31]. These items also demonstrate high loadings on the first unrotated factor, which indicates clinical relevance. Table 1 shows the labels of the 7 factors and the items with the highest loadings.

Item Statistics and Reliability
The index of discrimination (item-total correlation, table 2) proved to be very high. None of the scales contained a value below the critical threshold of 0.30. The mean item correlations (table 2) ranged from 0.31 (intrusions) to 0.56 (self-destruction), which is favorable in regard to homogeneity [32].

Cronbach's α was calculated to evaluate the internal consistency. The values for the subscales ranged from α = 0.80 to α = 0.94. The value for the total score was α = 0.97.

The test-retest reliability of the total scale after 1 week was r = 0.84 ($p < 0.001$). The values for the subscales ranged from r = 0.72 ($p < 0.001$; 'affect regulation') to r = 0.87 ($p < 0.001$; 'self-perception'). With the exception of the subscale 'hostility' (r = 0.44, $p < 0.01$) the test-retest reliabilities for all the subscales were > 0.50 ('self-destruction' r = 0.78, $p < 0.001$; 'dysphoria' r = 0.78, $p < 0.001$; 'loneliness' r = 0.82, $p < 0.001$, and 'intrusions' r = 0.79, $p < 0.001$).

Table 2. Items and test statistics (n = 308)

Scale	Item inter-correlations	Item discriminatory power	Internal consistency (Cronbach's α)
Self-perception	0.42 (0.20–0.74)	0.46–0.76	0.93
Affect regulation	0.38 (0.17–0.52)	0.41–0.66	0.88
Self-destruction	0.56 (0.32–0.87)	0.51–0.81	0.94
Dysphoria	0.46 (0.25–0.75)	0.39–0.77	0.88
Loneliness	0.36 (0.16–0.59)	0.37–0.69	0.87
Intrusions	0.32 (0.16–0.51)	0.40–0.64	0.82
Hostility	0.41 (0.27–0.72)	0.40–0.68	0.80

Figures in parentheses are ranges.

Table 3. Scale intercorrelation in female BPD patients (n = 308)

	Self-perception	Affect regulation	Self-destruction	Dysphoria	Loneliness	Intrusions	Hostility	Total score
Affect regulation	0.64	–	–	–	–	–	–	–
Self-destruction	0.68	0.66	–	–	–	–	–	–
Dysphoria	0.54	0.48	0.55	–	–	–	–	–
Loneliness	0.67	0.64	0.60	0.40	–	–	–	–
Intrusions	0.64	0.61	0.60	0.35	0.48	–	–	–
Hostility	0.41	0.50	0.40	0.21	0.57	0.42	–	–
Total score	0.89	0.84	0.86	0.64	0.80	0.75	0.58	–
Global well-being	0.64	0.63	0.68	0.72	0.50	0.48	0.30	0.74

All p values <0.001.

Validity

Table 3 shows the scale intercorrelations, which range from 0.21 ($p < 0.001$) to 0.68 ($p < 0.001$). The lowest correlation was found between the subscales dysphoria and hostility, the highest between the subscales self-destruction and self-perception. The correlations of the scales with the visual analog scale for global well-being were all statistically significant ($p < 0.001$) and ranged from 0.30 to 0.72 (table 3). The maximum common variance of the subscales was approximately 50%.

The correlations of the scales with the number of DSM-IV criteria were small and, except for the subscale intrusion, not statistically significant.

As shown in table 4, the BSL subscale and total scores of BPD patients were significantly higher than in healthy persons and patients with different Axis I disorders (schizophrenia, depression, anxiety or OCD). The BSL discriminates significantly between healthy controls and patients of the different Axis I diagnostic groups, an exception being the subscale dysphoria. On this particular scale the female borderline patients differ significantly only from healthy controls ($p < 0.001$) and patients with schizophrenia ($p < 0.001$).

The analyses of the 380 BPD patients yielded small correlations between gender and the individual scales of the BSL ($r < 0.17$). There were no indications of any age dependence of the scales either ($r < 0.07$). The correlations between the level of education and the scales were also slight ($r < 0.16$).

As the BSL claims to measure specific aspects of subjective impairments, this has to be proved empirically. The correlations with other scales should be as small as possible (divergent or discriminant validity) and only with scales or subscales which are linked up (convergent validity). High correlations are defined as statistically significant values of ≥ 0.50.

Only 1 of the 80 correlations of SCL-90-R and BSL (total and subscales) fulfilled these criteria. All but 1 correlation explain less than 25% of common variance. This indicates that the scales might measure different aspects of mental impairment.

Table 4. Comparison of patients with BPD, healthy controls and patients with Axis I disorders (ANOVA)

Scale	BPD (n = 380)	HC (n = 204)	S (n = 50)	MD (n = 84)	Anxiety (n = 19)	OCD (n = 29)	p
Self-perception	1.6 ± 0.90	0.2 ± 0.19	0.7 ± 0.69	1.2 ± 0.87	1.0 ± 0.91	1.0 ± 0.90	<0.001
Affect regulation	2.3 ± 0.90	0.4 ± 0.38	1.1 ± 0.73	1.5 ± 0.90	1.4 ± 0.80	1.4 ± 0.89	<0.001
Self-destruction	2.1 ± 1.2	0.0 ± 0.15	0.8 ± 0.85	1.2 ± 1.1	0.8 ± 0.58	0.8 ± 0.70	<0.001
Dysphoria	3.2 ± 0.70	1.6 ± 0.64	2.4 ± 0.77	3.1 ± 0.82	3.0 ± 0.68	2.8 ± 0.76	<0.001
Loneliness	1.9 ± 0.89	0.2 ± 0.28	0.8 ± 0.68	1.2 ± 0.85	1.1 ± 0.78	0.8 ± 0.15	<0.001
Intrusions	1.2 ± 0.81	0.0 ± 0.15	0.5 ± 0.63	0.6 ± 0.52	0.5 ± 0.62	0.6 ± 0.56	<0.001
Hostility	1.8 ± 0.96	0.5 ± 0.42	0.7 ± 0.50	0.8 ± 0.68	1.1 ± 0.73	1.0 ± 0.72	<0.001
Total scores	2.0 ± 0.76	0.4 ± 0.22	0.9 ± 0.60	1.4 ± 0.76	1.2 ± 0.68	1.2 ± 0.69	<0.001

Values are means ± SD. HC = Healthy controls; S = schizophrenia; MD = major depression.

As further aspects of psychopathological impairment, anxiety and depression were chosen. Only low correlations ($r < 0.50$) resulted between the BSL and procedures for the assessment of anxiety (STAI, HAMA) and aggression (STAXI).

As expected the correlations of the depression scales (BDI, HAMD) were higher, as the BSL subscales measure the same dimension. The BDI correlated with the individual subscales self-destruction ($r = 0.51$, $p = 0.03$), dysphoria ($r = 0.56$, $p = 0.02$) and loneliness ($r = 0.71$, $p < 0.01$). The highest correlation scored with the HAMD and the BSL total score ($r = 0.62$, $p < 0.01$) and 4 subscales (self-perception, affect regulation, self-destruction and dysphoria).

Furthermore positive correlations were observed between the BSL total score and a self-report procedure for assessment of dissociations (FDS, the German version of the DES). Positive correlations also resulted for the total score on the FDS and the BSL subscales self-perception ($r = 0.63$, $p < 0.01$), intrusions ($r = 0.67$, $p < 0.01$) as well as between the FDS subscale depersonalization/derealization and the BSL subscales self-perception ($r = 0.77$, $p < 0.001$), intrusions ($r = 0.74$, $p < 0.001$), affect regulation ($r = 0.52$, $p < 0.02$) and total score ($r = 0.53$, $p < 0.01$). As the constructs are related, these findings were expected.

A prerequisite for the quantification of the symptoms and for the categorization according to the degree of severity and recording of potential psychopathological changes is the exclusion of floor or ceiling effects.

Figure 1 shows the total scores of distribution of the 308 female BPD patients. These range from 0.13 to 3.63. It is approximately normally distributed. The values for
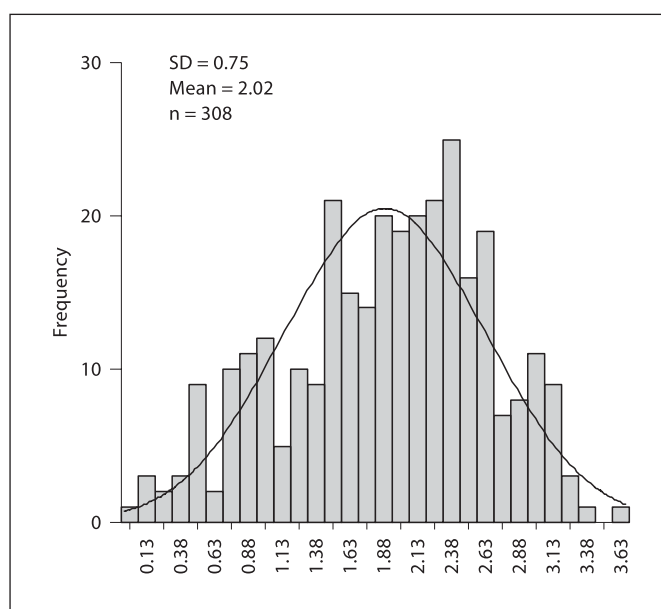
Fig. 1. Distribution of BSL total scores over a sample of 308 female BPD patients.

skewness (–0.327) and kurtosis (–0.527) are within an acceptable range.

The BSL was administered twice at an interval of 12 weeks to 63 female BPD patients to measure its sensitivity to change. The BPD patients were treated over the course of 12 weeks as either in- or outpatients according to the disorder-specific concept of DBT (according to Marsha Linehan [33]). Table 5 shows the BSL scores at the beginning of the therapy and the outcome 12 weeks later.

Table 5. Comparison of the BSL scales pre-post t test (n = 64)

Scale	Pre	Post	t test		
			t	d.f.	p
Self-perception	1.79 ± 0.82	1.47 ± 0.94	3.061	63	0.003
Affect regulation	2.39 ± 0.78	2.09 ± 0.90	3.136	63	0.003
Self-destruction	2.11 ± 1.14	1.74 ± 1.23	2.146	51	0.037
Dysphoria	3.20 ± 0.66	2.96 ± 0.80	2.757	63	0.008
Loneliness	1.78 ± 0.81	1.61 ± 0.86	1.536	63	0.130
Intrusion	1.28 ± 0.80	1.07 ± 0.74	2.656	63	0.010
Hostility	1.59 ± 0.84	1.51 ± 0.85	0.758	63	0.451
Total	2.09 ± 0.68	1.80 ± 0.82	3.138	63	0.003

Pre and post values are means ± SD.

With the exception of the subscales loneliness and hostility, the patients improved significantly on the total scale and the remaining 5 subscales.

Discussion

The BSL was developed to assess the BPD-specific symptomatology. From an item pool of 99 complaints, a scale consisting of 95 items was generated. In addition to the total score used to evaluate the extent of impairment, 7 subscales were constructed to measure the various aspects of the impairment. The scales demonstrated good to excellent psychometric properties (discriminatory power, reliability). Almost all the item intercorrelations fell within a range favorable for the homogeneity of the scale (0.15–0.50; see Stieglitz [34] for a summary). Higher coefficients were expected above all for the narrow constructs such as the subscale self-destruction. The internal consistency (Cronbach's α) proved very high for all the scales. This is especially favorable for a self-report procedure (see Stieglitz [34]), particularly for the subscale hostility, which consists of only 6 items. Comparisons of these results with those for scales encompassing similar areas confirm them. Fahrenberg [35] determined reliability coefficients (Cronbach's α) for the Freiburger Beschwerdeliste (Freiburg Complaint List) between α = 0.73 and α = 0.90 for the subscales and α = 0.95 for the total scale. Franke [31] found values between α = 0.51 and α = 0.84 for nonclinical groups and values between α = 0.78 and α = 0.89 for clinical groups on the SCL-90-R. Stieglitz [34] found Cronbach's α of the SCL-90-R between α = 0.74 and α = 0.90 at admission for a heterogeneous sample of psychiatric patients and values between α = 0.77 and α = 0.92 upon release from hospital. The test-retest reliability for a 1-week period was in a high range for almost all the subscales. An exception was the subscale hostility, which might reflect the state dependence of anger and irritability in patients with BPD.

The analyses of validity also yielded favorable results. There was no particular influence of gender, age or level of education on the evaluation of the scales. The intercorrelations of the subscales were comparable to the scores for survey instruments that measure mental impairments in a similar direction (e.g. SCL-90-R). The correlation of the scales with the visual analog scale for global well-being indicated a clear and plausible correlation between global and specific estimates. In contrast the number of DSM-IV criteria fulfilled did not correlate with the degree of self-reported impairment. The comparison of BPD patients to healthy controls and patients with a different Axis I diagnosis showed that the BSL distinguishes between BPD patients and healthy persons or those from other patient groups. With regard to convergent and divergent validity there were plausible correlations altogether. These correlations were higher with structurally related than with more structurally distant scales. Nevertheless, aside from a few exceptions, the correlations between the structurally related scales were all midrange, which indicates a conceptual independence of the aspects measured with the BSL. The preliminary data on the sensitivity to change showed good results. In the course of a 12-week disorder-specific treatment of BPD, the BSL indicated significant improvements in the total impairment as well as within 5 symptom areas.

Moreover it is crucial to corroborate the sensitivity to change, since this instrument has been designed primarily for the evaluation of therapy effects. In order to substantiate the stability of the factor structure, we are currently studying a German-speaking sample, whose data

will be compared to those concurrently gathered from a patient cohort in the USA. In addition a brief version of the scale is being developed for an extended area of application.

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