

# Validation of the Korean version of the Borderline Symptom List Short Version (K-BSL-23)

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For efficient screening and assessment of borderline personality disorder (BPD) in clinical and research settings, this study aimed to validate the Korean version of the Borderline Symptom List Short Version (K-BSL-23). We recruited 200 community sample adults with BPD tendencies in Study 1 and examined construct validity and internal reliability. In Study 2, we analyzed a receiver operating characteristic curve of the K-BSL-23 scores of 42 psychiatric outpatients with BPD and 45 non-diagnosed control groups to derive the sensitivity and specificity of each cut-off score. The K-BSL-23 score had a single-factor structure and excellent internal consistency. The K-BSL-23 score showed significant correlations with the borderline scale of the Korean Personality Disorders Test, showing concurrent validity, with emotional regulation difficulties, impulsivity, and depression supporting convergent validity. In addition, the K-BSL-23 score was correlated with adverse childhood experiences. Divergent validity of the K-BSL-23 score among cluster B personality disorders was tentative and requires further research. The supplementary scale, the K-BSL-S, showed high concurrent validity in measuring self-harm behaviors. A cut-off score of 14.5 validly distinguished the BPD patient group from the non-diagnosed control group. The K-BSL-23 score was shown to be a valid measure for BPD symptoms.

**Keywords:** borderline personality disorder, the Borderline Symptom List short version (BSL-23), adverse childhood experiences, emotion dysregulation, self-harm behavior

## Introduction

Borderline personality disorder (BPD) is characterized by pervasive patterns of difficulty in interpersonal relationships, unstable

sense of self, emotion dysregulation, self-harm or suicidal behaviors, chronic feelings of emptiness, and severe dissociation (APA, 2013). The prevalence of BPD in the United States (US) general population ranged from 1.4% (Lenzenweger et al., 2007) to 2.7% (Trull et al., 2010). Among US psychiatric outpatients, the prevalence of BPD was 9.3%, which was the second highest among personality disorders (Zimmerman et al., 2005). Among US psychiatric inpatients, the prevalence ranged from 6.5% to 42.7% (Zimmerman et al., 2008). However, the prevalence of BPD in Korea has not been reported.

BPD is primarily a pervasive emotional dysregulation disorder with an etiology related to biologically and socially developed vulnerabilities in emotion regulation (Linehan, 1993). Evidence indi-

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Received Nov 06, 2022; Revised Apr 10, 2023; Accepted Apr 12, 2023

This study was based on the first author's postgraduate thesis. This research was supported by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number: HC20C0140).



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cated that emotional dysregulation and impulsivity are strongly associated with BPD construct (Chapman et al., 2008; Koenigsberg et al., 2001; Links et al., 1999). The relationship with depressive symptoms and self-harm behaviors were also examined, where depressive disorder was the most common comorbid disorder with BPD and self-harm behavior was one of the diagnostic criteria highly shown in BPD. The prevalence of mood disorders and major depressive disorder in BPD patients was 75%-96.9% and 32.1%-86.6%, respectively (Grant et al., 2008; Zanarini, Frankenburg, Hennen, et al., 2004). Self-harm is a symptom of BPD, and the prevalence of non-suicidal self-injury (NSSI) in BPD patients was 95% (Goodman et al., 2017) and that of suicidal behavior was over 75% (Black et al., 2004). For risk factors of BPD, childhood abuse and severe neglect have been identified (Bandelow et al., 2005; Guzder et al., 1996; Zanarini et al., 2001), and a recent meta-analysis found evidence that children who experienced more than one abusive event across developmental periods showed higher levels of borderline features (Ibrahim et al., 2018).

For the diagnosis of BPD, structured interviews such as the Revised Diagnostic Interview for Borderlines (DIB-R; Zanarini et al., 1989) and the Clinical Global Impression Scale for Borderline Personality Disorder Patients (CGI-BPD; Pérez et al., 2007) have been developed and widely used. While structured interviews require time, expense, and trained interviewers, self-report measurements are useful to efficiently measure fluctuations in symptoms along with treatment and for screening purposes in research and clinical settings. As one of the most widely used self-report measurements for BPD in Korean, the Personality Assessment Inventory-BOR (PAI-BOR), developed by Morey (1991), was validated by Hong and Kim (1998). However, a network analysis has shown that some items measuring impulsivity in the PAI-BOR scale may not adequately reflect the representative characteristics of impulsivity in BPD (Kim & Choi, 2020). In addition, it was discussed that the PAI-BOR cut-off score of 38 (positive predictive power = .08) may not adequately screen people with BPD (Trull, 1995). The Korean Personality Disorder Test (K-PDT; Seo & Hwang, 2006) developed in Korea, is used to measure BPD symptoms, however, the validity of assessing BPD symptom severity or symptom change has not been clarified and the cut-off score is not provided.

Meanwhile, the Borderline Symptom List (BSL) is a well-established

self-report measurement widely used to assess BPD symptoms with good psychometric properties encompassing a broad range of symptom severity and was also sensitive to symptom change (Bohus et al., 2009; Kleindienst et al., 2020). The 95-item self-report scale (BSL-95) developed by Bohus et al. (2001) measures borderline symptoms based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and opinions of clinical experts and borderline patients. The BSL has sensitively reflected BPD symptom changes over treatment with borderline patients (Bohus et al., 2007). Additionally, Bohus et al. (2009) developed the Short Version of the Borderline Symptom List (BSL-23), which has increased the utility and efficiency in clinical and research settings. The BSL-23 is composed of 23 items that best reflect BPD symptoms, while validly differentiating BPD from other DSM-IV Axis I disorders (Bohus et al., 2009; Glenn et al., 2009). Recently, the BSL-23 was shown to distinguish six levels of symptom severity and a cut-off score was reported that differentiated the BPD patient group from the healthy control group (Kleindienst et al., 2020). The BSL-23 has been translated into Spanish, French, and Chinese versions, all of which have shown reasonable validity (Nicastro et al., 2016; Soler et al., 2013; Yang et al., 2018). In addition, Bohus et al. (2001) developed an 11-item supplementary scale for BPD (BSL-Supplement, BSL-S) that can be used along with the BSL-23 to measure various self-harm, suicidal, and high-risk behaviors more specifically which can be assessed every week. Thus, the BSL-S can be used to facilitate immediate interventions by identifying at-risk individuals and is widely used in studies validating the efficacy of evidence-based therapy (Kleindienst et al., 2021).

Therefore, for efficient use of measuring and screening BPD symptomatology along with supplement items to measure immediate self-harm behaviors, this study sought validation of the Korean version of the BSL-23 (K-BSL-23) and BSL-S (K-BSL-S) and identified a cut-off score for BPD to use in clinical and research settings. In Study 1, the construct validity was examined among people with borderline personality tendencies in a community sample. First, the relationship between demographic characteristics such as age and gender and BPD (Eaton & Greene, 2018; Sansone & Sansone, 2011) was examined. Second, to determine construct validity, factor structure of the K-BSL-23 score and its relationship with emotion dysregulation (Chapman et al., 2008; Koe-

nigsberg et al., 2001; Linehan, 1993), impulsivity (Links et al., 1999), depression (Grant et al., 2008; Zanarini, Frankenburg, Hennen, et al., 2004), self-harm (Black et al., 2004; Goodman et al., 2017), and childhood adversity (Ibrahim et al., 2018; Zanarini et al., 2001) were examined. Third, to determine divergent validity, the relationships between the K-BSL-23 score with measures of antisocial, narcissistic, and histrionic personalities, which are other DSM cluster B syndromes (APA, 2013), were examined. Finally, to determine the validity of the K-BSL-S, its relationship with emotion dysregulation, impulsivity, self-harm, depression, adverse childhood experiences, and other cluster B personality symptoms were examined. In Study 2, with BPD patients in psychiatric outpatient settings and non-diagnosed individuals, we identified a cut-off score and the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) for the K-BSL-23, which would effectively screen people with BPD.

## Study 1

### Method

#### Participants and procedures

The study protocol was approved by the Institutional Review Board (IRB) of Chungbuk National University (CBNU-202202-HR-0264). Participants were recruited from an online panel where advertisements for participation were sent to 29,055 random members. Among them, 8,610 people started the survey after giving online informed consent. The inclusion criteria were age  $\geq 19$  years and the PAI-BOR score  $\geq 38$ , which was the cut-off score for BPD tendencies (Trull et al., 1997). Based on the inclusion criteria, 200 participants were eligible; however, eight were discarded because of incoherent responses. Additional participants were recruited and a total of 200 data collections were completed. For participation, the online survey company provided credits that could be used on their website.

#### Measure

#### *Korean version of the Borderline Symptom List short version (K-BSL-23 & K-BSL-S)*

One clinical psychologist fluent in both English and Korean translated the English version of the BSL-23 into Korean, which was

back-translated into English by an independent professional translator without any knowledge of the BSL-23. Experienced clinical psychologists reviewed whether the results were consistent with the original BSL-23. The K-BSL-23 consists of 23 items of borderline symptoms experienced over the past week. Each item is responded with a 5-point Likert scale ranging from 0 (*not at all*) to 4 (*extremely*). Higher scores indicated more severity of BPD symptoms (Bohus et al., 2009). The K-BSL-S consists of 11 items assessing the frequency of self-harm behaviors occurred over the past week. Each item is responded with a 5-point Likert scale ranging from 0 (*Not at all*), 1 (*once*), 2 (*2-3 times*), 3 (*4-6 times*), and 4 (*everyday more than once*).

#### *Personality Assessment Inventory–BOR (PAI–BOR)*

The PAI-BOR was developed and validated by Morey (1991) to measure BPD symptoms and validated by Hong and Kim (1998) into the Korean version. It consists of 23 items rated on a 4-point Likert scale. In Hong and Kim (1998) and in this study, Cronbach's  $\alpha$  were .84 and .59, respectively.

#### *Korean version of the Difficulties in Emotion Regulation Scale (K-DERS)*

The K-DERS was developed and validated by Gratz and Roemer (2004) to measure the difficulty of emotional regulation and validated by Cho (2007) into the Korean version. It is a 35-item measurement responded by a 5-point Likert scale, where higher scores indicate greater difficulty in regulating emotions. The total K-DERS score was used for the analysis. In Cho (2007) and in this study, Cronbach's  $\alpha$  were .92 and .94, respectively.

#### *Korean Version of Barratt Impulsiveness Scale–11–Revised (K-BIS–11–R)*

The K-BIS-11-R was developed and validated by Patton et al. (1995) to measure impulsivity and validated by Lee et al. (2012) into the Korean version. It is a 30-item scale with a 4-point Likert scale, with higher scores indicating higher impulsivity. In Lee et al. (2012) and in this study, Cronbach's  $\alpha$  were .78 and .87, respectively.

#### *Patient Health Questionnaire–9 (PHQ–9)*

The PHQ-9 was developed and validated by Spitzer et al. (1999)

based on the depressive episodes of DSM-IV diagnostic criteria and validated by Park et al. (2010) into the Korean version. It has nine items and is responded by a 4-point Likert scale. In Park et al. (2010) and in this study, Cronbach's  $\alpha$  were .81 and .92, respectively.

#### *Korean version of the Self-Harm Inventory (K-SHI)*

The K-SHI was developed and validated by Sansone et al. (1998) to measure self-harm behavior and validated by Kim et al. (2019) into the Korean version. Each item can be responded to with a "yes" or "no", depending on whether the respondent was involved in each self-harm behavior. It consists of 22 items, with higher scores indicating more self-harm behaviors. In Kim et al. (2019) and in this study, Cronbach's  $\alpha$  were .76 and .93, respectively.

#### *The Adverse Childhood Experience International Questionnaire (ACE-IQ)*

The ACE-IQ was developed by the World Health Organization (WHO, 2018) to measure adverse childhood experiences. We used the Korean version of the ACE-IQ short version (Choi et al., 2021). It has 11 items and can be responded with a "yes" or "no" to whether as a child under 18 had experienced emotional neglect or abuse, physical neglect or abuse, or sexual abuse; lived with an alcohol or substance-addicted family member; lived with a family member who has depression, mental disorder, or suicidal behavior; lived with a family member who had been incarcerated; experienced separation or death of parents; witnessed violence between parents or caregivers; or were exposed to violence among peers or witnessed violence in community.

#### *The Korean Personality Disorders Test (K-PDT)*

The K-PDT is a self-report scale developed by Seo and Hwang (2006) to measure personality disorder symptoms according to the DSM-IV. It consists of 113 items responded by a 4-point Likert scale. We used 48 items including Borderline (BL), Antisocial (AS), Narcissistic (NC), and Histrionic (HT) scales. In Seo and Hwang (2006), the Cronbach's  $\alpha$  was .72 in BL, .70 in AS, .66 in NC, and .61 in HT. In this study, the Cronbach's  $\alpha$  was .86 in BL, .79 in AS, .52 in NC, and .15 in HT. As the HT scale showed extremely low internal consistency, it was excluded from further analysis.

## Analyses

Analyses were conducted using the SPSS 28. First, demographic characteristics of the participants were described. Second, we conducted a principal component analysis (PCA) with a direct oblimin rotation (Jang, 2015) to confirm the factor structure of the K-BSL-23 and internal consistency (Cronbach's  $\alpha$ ) values were calculated. Third, we conducted a parallel analysis using the Jamovi ver. 2. 3. 21. Correlation analyses were conducted to examine the concurrent, convergent, and divergent validity. Effect sizes were interpreted as values from .1 to .3 indicating a small effect size, .3 to .5 a medium effect size, and values above .5 a large effect size (Cohen, 1992).

## Results

Socio-demographic characteristics of the participants  
Among the participants, 111 were men (55.5%), 88 were women (44%), and one (0.5%) was non-binary. The mean age was 41 years ( $SD = 9.98$ , range = 20-64). Education levels showed that 37 (18.5%) were high school graduates and 163 (81.5%) had over college degree. Marital status showed that 104 (52%) were married and 96 (48%) were single, separated, or divorced. Current occupation showed that 131 (65.5%) people were fully employed and 69 (34.5%) had no full-time work.

#### Factor analysis and reliability of the K-BSL-23 score

Table 1 presents the results of the PCA and reliability analysis. The mean ( $M = 1.62-2.23$ ) and standard deviation ( $SD = 1.26-1.46$ ), skewness (-1.50- -0.97), and kurtosis (-0.35-0.23) for each item were acceptable. The internal consistency of K-BSL-23 was excellent with a Cronbach's  $\alpha$  value of .98.

The Kaiser-Meyer-Olkin (KMO) score (.97) and Bartlett's Test of Sphericity were significant ( $\chi^2 = 4,663.597$ ,  $df = 253$ ,  $p < .001$ ). The PCA yielded two factors with eigenvalues greater than one (15.287 and 1.225, respectively), accounting for 71.8% of the total variance. However, the scree plot revealed only one dominant factor. The single-factor model explained 66.5% of the total variance. This was supported by a parallel analysis, in which one factor had an eigenvalue above one (14.947) accounting for 65% of the total variance and the scree plot suggested a single-factor structure. The factor loading for each item from the PCA was above .4 (range = .526-.787, see Table 1).

**Table 1.** Characteristics of Each K-BSL-23 Item

Item summary	<i>M</i>	<i>SD</i>	Skewness	Kurtosis	Factor loading	Cronbach's alpha when item is deleted
1 Difficulty in concentration	2.23	1.31	-0.35	-0.97	.601	.98
2 Helplessness	2.21	1.41	-0.32	-1.20	.780	.98
3 Difficulty in attention and memory	1.92	1.43	-0.11	-1.35	.622	.98
4 Disgust	2.04	1.40	-0.19	-1.30	.672	.98
5 Thoughts of self-harm	1.67	1.43	0.10	-1.50	.710	.98
6 Not trusting people	2.07	1.26	-0.17	-1.05	.526	.98
7 Mistrust in right to live	1.82	1.40	-0.04	-1.40	.668	.98
8 Loneliness	2.02	1.38	-0.16	-1.21	.707	.98
9 Feeling inner tension	2.10	1.36	-0.20	-1.09	.764	.98
10 Scary images	1.86	1.40	-0.07	-1.36	.695	.98
11 Hate oneself	2.05	1.41	-0.22	-1.29	.778	.98
12 Wish to punish oneself	1.74	1.34	0.07	-1.30	.689	.98
13 Shame	1.74	1.38	0.05	-1.33	.774	.98
14 Mood fluctuation	2.04	1.41	-0.19	-1.25	.779	.98
15 Voices or noises in and out of head	1.69	1.41	0.09	-1.36	.725	.98
16 Feeling horrible being judged	1.75	1.44	0.07	-1.39	.750	.98
17 Feeling vulnerable	1.96	1.36	-0.17	-1.25	.689	.98
18 Fascinated by thoughts of death	1.62	1.40	0.26	-1.25	.780	.98
19 Feeling meaningless	1.84	1.40	0.03	-1.38	.732	.98
20 Afraid of losing control	1.77	1.43	0.07	-1.37	.787	.98
21 Disgust with oneself	1.83	1.46	0.02	-1.44	.785	.98
22 Feeling distant from oneself	1.72	1.40	0.07	-1.33	.740	.98
23 Worthlessness	1.97	1.40	-0.11	-1.29	.760	.98

Concurrent, convergent and discriminant validity of the K-BSL-23 score

Table 2 presents correlation values among variables. All correlations were significant with a *p* value of  $< .01$ . For concurrent validity, the K-BSL-23 score showed a large correlation with the K-PDT-BL score. For convergent validity, the K-BSL-23 score manifested a large correlation with emotional dysregulation, impulsivity, and depressive symptoms. Self-harm behavior score was moderately correlated. In addition, the K-BSL-23 score showed a moderate correlation with adverse childhood experiences.

The K-BSL-S score showed a large correlation with the K-BSL-23 score and self-harm behavior and showed a medium correlation with the K-PDT-BL score. In addition, the K-BSL-S showed a medium correlation with emotion dysregulation, impulsivity, depressive symptoms, and adverse childhood experiences.

In the discriminant validity analyses, the K-BSL-23 score showed a medium correlation effect size with the K-PDT-NC score and a large correlation effect size with the K-PDT-AS score. Six items were identical in both the K-PDT-BL and K-PDT-AS, and when

**Table 2.** Clinical correlates of the K-BSL-23 and K-BSL-S

	K-BSL-23	K-BSL-S
K-BSL-S	.57**	-
Emotion dysregulation (K-DERS)	.78**	.45**
Impulsivity (K-BIS-11-R)	.70**	.44**
Depression (PHQ-9)	.68**	.49**
Self-harm behavior (K-SHI)	.41**	.66**
Adverse childhood experience (ACE-IQ)	.33**	.46**
Borderline personality disorder (K-PDT-BL)	.70**	.43**
Narcissistic personality disorder (K-PDT-NC)	.43**	.30**
Antisocial personality disorder (K-PDT-AS)	.62**	.49**

*Note.* K-BSL-23 = Korean version of the Borderline Symptom List short version; K-BSL-S = Korean version of the Borderline Symptom List Supplement; K-DERS = Korean Difficulties in Emotion Regulation Scale; K-BIS-11-R = Korean Barratt Impulsiveness Scale-11-Revised; PHQ-9 = Patient Health Questionnaire-9; K-SHI = Korean Self-Harm Inventory; ACE-IQ = Adverse Childhood Experience International Questionnaire; K-PDT-BL = Korean Personality Disorders Test-Borderline; K-PDT-NC = Korean Personality Disorders Test-Narcissistic; K-PDT-AS = Korean Personality Disorders Test-Antisocial.  
\*\**p* < .01.

they were excluded from the K-PDT-AS, the correlation of the K-PDT-AS and K-BSL-23 scores was lowered to a value of  $r = .56$ .

**Table 3.** Differences of the K-BSL-23 score Between Demographic Characteristics

Demographic variables		Averaged K-BSL-23 score				
		N (%)	M	SD	t (df)	p
Gender	Men	111 (55.8)	1.86	1.14	-0.513 (197)	.61
	Women	88 (44.2)	1.94	1.13		
Education levels	High school graduation	37 (28.5)	2.05	1.12	0.898 (198)	.37
	Above college graduation	163 (81.5)	1.86	1.14		
Cohabitation	Live alone	34 (17.0)	1.88	0.18	-0.105 (198)	.92
	Have cohabitant	166 (83.0)	1.90	0.09		
Marital status	Married	104 (52.0)	1.79	1.20	-1.384 (197.533)	.17
	Single, separated, or divorced	96 (48.0)	2.01	1.05		
Household income	Under ₩2,000,000 per month	25 (12.5)	2.17	1.06	1.314 (198)	.19
	Over ₩2,000,000 per month	175 (87.5)	1.86	1.14		
Current occupation	Fully employed	131 (65.5)	1.95	1.14	0.883 (198)	.38
	Other than full employment	69 (34.5)	1.80	1.11		

Relationship with the K-BSL-23 score and socio-demographic variables

As presented in Table 3, there were no significant differences in the K-BSL-23 scores according to gender, education level, cohabitation, marital status, income, or occupational status. The K-BSL-23 score showed a medium negative correlation with age ( $r = -.31, p < .001$ ).

### Study 2

#### Method

##### Participants

The data collection was approved by the IRB of Yonsei University Gangnam Severance Hospital (3-2021-0095), Yeungnam University Hospital (2021-02-046), and Chungbuk National University (CBNU-202202-HR-0264). Advertisements were disseminated in the online communities of Yonsei University Gangnam Severance, Yeungnam University Hospital, and Chungbuk National University. For BPD diagnoses, we recruited patients who visited the psychiatry outpatient clinic. For non-diagnosed people, we recruited Chungbuk and Yonsei University members. We collected data from 87 participants from a total of 107 applicants through a screening process using the SCID-5-SPQ (Screening Personality Questionnaire) BPD. All the participants provided informed consent. The exclusion criteria for the BPD diagnosis group included having psychotic symptoms, brain injury, neurological dysfunctions, intellectual disability, and any serious physical disease that may affect mental health. The exclusion criteria for the non-diag-

nosed group were a diagnosis of a mental disorder or any serious physical disease that may affect mental health. Participants completed the K-BSL-23 and structured interviews to diagnose BPD.

##### Measure

*The Korean version of the Borderline Symptom List short version (K-BSL-23)*

Identical as Study 1.

*Structured Clinical Interview for DSM-5 disorders Personality Disorders (SCID-5-PD) BPD*

We used a Korean translated version of the SCID-5-PD as a structured diagnostic interview tool for personality disorders based on the diagnostic criteria of the DSM-5 (First et al., 2016/2017). Among these, we used the BPD interview consisting of 14 questions to identify BPD symptoms. Nine symptoms of DSM-5 BPD are rated from 0 to 2, where five or more of them rated as 2 would fulfill the diagnosis of BPD.

##### Analyses

All analyses were performed using SPSS 28. We analyzed the Receiver Operating Characteristic (ROC) curve to determine the cut-off point with the highest sensitivity and specificity based on the ROC Area Under Curve (AUC) and Youden index (Youden, 1950). The ROC curve illustrates the performance of classification by showing the sensitivity and 1-specificity levels at each cut-off point (Fawcett, 2006). The AUC yields from 0.5 (noninformative

test) to 1 (perfect prediction) (Pak & Oh, 2016). Additionally, we calculated the Positive Predictive Value (PPV) and Negative Predictive Value (NPV) based on the cut-off point.

## Result

Socio-demographic characteristics of the participants

The BPD diagnosed clinical group ( $n = 42$ ) included 27 men (64.3%) and 15 women (35.7%), with a mean age of 27.64 years ( $SD = 5.89$ , range = 19-46). Education levels showed that one (2.4%) had a middle school education, 13 (31%) a high school education, 25 (59.5%) an undergraduate education, and three (7.1%) a graduate degree. Marital status showed that 35 (83.3%) were married, four (9.5%) cohabited, two (4.8%) single, and one (2.4%) was divorced. Current occupation showed nine (21.4%) had a full-time job, three (7.1%) a part-time job, 20 (47.6%) were unemployed, and ten (23.8%) reported that they had other jobs.

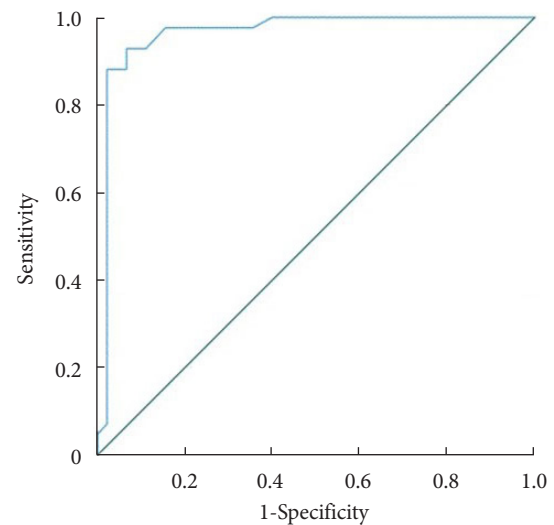
The non-diagnosed group ( $n = 45$ ) included 23 men (51%) and 22 women (49%), with a mean age of 30.29 years ( $SD = 9.48$ , range = 19-48). Regarding education levels, 21 (46.7%) had a high school education, 17 (37.8%) an undergraduate education, and seven (15.6%) a graduate education. Marital status showed that 14 (31.1%) were married and 31 (68.9%) were single. Current occupation showed that six (13.3%) had a full-time job, eight (17.8%) a part-time job, 20 (44.4%) were unemployed, ten (22.2%) were homemakers, and one (2.2%) reported "other".

Cut-off score of the K-BSL-23

The ROC AUC for the K-BSL-23 mean scores were .96 ( $p < .001$ , Fig. 1). The Youden index reached .863 with the highest value at K-BSL-23 score of 14.5, where the simultaneous pair of sensitivity and specificity were 92.9% and 93.3%, respectively (Table 4). Additionally, when BPD was diagnosed using this cut-off score, the PPV and NPV were 92.9% and 93.3%, respectively.

## General Discussion

This study examined the validity of the K-BSL-23 score in a community sample with borderline tendencies and identified a cut-off score distinguishing the BPD diagnosed clinical group from the non-diagnosed group. The K-BSL-23 showed good structural va-



**Figure 1.** The receiver operating characteristic curve of the K-BSL-23.

**Table 4.** Sensitivity, Specificity, and the Youden Index of each K-BSL-23 Cut-off Scores

Cut-off score	Sensitivity	Specificity	Youden index
10.5	.976	.844	.820
11.5	.952	.867	.819
12.5	.929	.889	.818
13.5	.929	.911	.840
14.5	.929	.933	.862
15.5	.881	.933	.814
16.5	.881	.933	.814
19	.881	.956	.837
21.5	.881	.978	.859

lidity with a single-factor structure, along with high internal reliability, and the cut-off score showed sufficient sensitivity and specificity to distinguish the BPD clinical group from the non-diagnosed group.

The single-factor structure suggests that it is appropriate to use the total K-BSL-23 score, which was also shown in the original BSL-23 validation study (Bohus et al., 2009). Cronbach's  $\alpha$  of K-BSL-23 was .98 showing high reliability, which is a similar level to that of the English and Spanish version of BSL-23 (Bohus et al., 2009; Soler et al., 2013). The deletion of any item did not increase Cronbach's  $\alpha$  value, confirming that all items measured by the K-BSL-23 reflected the BPD symptoms.

Our findings supported the concurrent and convergent validity of the K-BSL-23, as the K-BSL-23 score showed large effect size correlations with each hypothesis. The K-BSL-23 score showed a

large effect size positive correlation with the K-PDT-BL score, supporting its concurrent validity. In addition, large effect size correlations were shown for emotion dysregulation and impulsivity, which are the primary symptoms of BPD, supporting construct validity. Additionally, a large effect size correlation was observed for depression, which is the most common comorbid mental disorder, supporting convergent validity. This was consistent with previous research showing large effect size correlation of BPD symptoms with emotional regulation ( $r = .64$ ; Glenn et al., 2009), with impulsivity ( $r = .54$ ; Yang et al., 2018), and with depression ( $r = .55-.79$ ; Nicastro et al., 2016; Soler et al., 2013).

Additionally, the K-BSL-23 showed a medium effect size positive correlation with childhood adversity, which is a known risk factor for BPD. This result supported that the severity of BPD symptoms increases with the number of adverse childhood experiences. In the Chinese version of the BSL-23, correlation between the BSL-23 score and childhood abuse and neglect was  $r = .35$  (Yang et al., 2018), which is similar to the results of this study.

Our results showed that the K-BSL-S score validly measured suicidal and self-harm behaviors in BPD symptoms. Supporting concurrent validity, the K-BSL-S score showed a large positive correlation with self-harm behavior measures. The K-BSL-S showed a medium positive correlation with the measurements of emotion dysregulation, impulsivity, depression, and adverse childhood experiences. Because the K-BSL-S has a large correlation with the K-BSL-23 score, we may suggest that the K-BSL-S score represents self-harm behaviors related to BPD symptoms. Therefore, we expect that the K-BSL-S score will assist in identifying BPD patients with current self-harm and high-risk behaviors.

The divergent validity of the K-BSL-23 score for cluster B personality disorders was tentative. First, the K-BSL-23 score showed a medium effect size correlation with the K-PDT-NC, which measures narcissistic personality symptoms. BPD and NPD share common features of cluster B personality disorders such as unstable emotionality, which is also shown by the high comorbidity rate between NPD and BPD (38.9%; Stinson et al., 2008). However, considering that the K-BSL-23 score showed a large effect size correlation with the K-PDT-BL score, supporting concurrent validity, the medium effect size correlation between the K-BSL-23 and K-PDT-NC scores may suggest that people with BPD and NPD may

show differentiated levels in K-BSL-23 scores, which requires further examination.

Second, a large effect size correlation was found between K-BSL-23 scores and antisocial personality symptoms. A high effect size correlation was maintained even when six items of the K-PDT-AS, which were identical to the K-PDT-BL items, were deleted. This may be in line with the reported comorbidity rate of BPD and antisocial personality disorder, which was 22.7% (Zanarini et al., 1998). Additionally, this may be associated with the impulsivity factor that is known as a primary common factor between BPD and antisocial personality disorder (Fossati et al., 2004; Turner et al., 2017). This was supported by our additional hierarchical regression analysis, which found that, when impulsivity (K-BSI-11-R) was entered into the analysis, the  $\beta$  of the BSL-23 predicting the K-PDT-AS score decreased to .18 ( $t = 2.824, p < .01$ ), compared to when the BSL-23 was entered alone ( $\beta = .62, t = 11.051, p < .001$ ).

It is possible that the items of the K-PDT-AS may not represent antisocial behaviors that are distinguished from anger control symptoms in BPD. In a validation study of the K-PDT scale, the correlation between the K-PDT-BL and K-PDT-AS scores was  $r = .72$  ( $p < .01$ ), which was the highest  $r$  value among the ten personality disorder scales (Seo & Hwang, 2006). Further studies are needed to examine the divergent validity of K-BSL-23 scores in relation to cluster B personality disorders.

The ROC AUC of the K-BSL-23 was good at .96 and a cut-off score of 14.5 distinguished the BPD patients from non-diagnosed people with sufficient sensitivity and specificity values. Similarly, in German clinical and non-clinical samples, a cut-off score of 14.7 was identified that distinguished the clinical group from the healthy control group (Kleindienst et al., 2020).

There are limitations of our study. First, it was not verified whether the K-BSL-23 consistently measures BPD symptoms over time, and a test-retest reliability analysis should be conducted. However, because fluctuations in symptoms are a core characteristic of BPD (APA, 2013), consistency may not be guaranteed. It is important for future studies to determine how to capture the fluctuations that underlie BPD symptoms. Second, we were not able to confirm whether the K-BSL-23 sensitively reflects BPD symptom changes throughout treatment. A previous study showed that the BSL-23 score sensitively reflected BPD symptom changes through-



out treatment (Bohus et al., 2009), and follow-up studies may help determine whether the K-BSL-23 score can track symptom changes according to treatment. Finally, the K-BSL-23 score was not fully proven to be able to distinguish BPD symptoms from other cluster B symptoms. Furthermore, research using the K-BSL-23 with participants diagnosed with BPD and other highly comorbid personality disorders, not only cluster B but others such as paranoid, avoidant, and dependent personality disorders (Zanarini et al., 1998; Zanarini, Frankenburg, Vujanovic, et al., 2004), would help determine the divergent validity and utility of the K-BSL-23 instrument in various clinical settings.

This study supported the construct validity and internal reliability of the K-BSL-23 score as a self-report scale for measuring BPD symptoms and identified a cut-off score that distinguished the BPD patient group from the non-diagnosed group. We suggest that the K-BSL-23 is a convenient tool that can be efficiently used in research and clinical settings, facilitating the valid assessment of BPD symptomatology and core BPD symptom constructs, such as emotion dysregulation and impulsivity. In addition, the use of supplemental K-BSL-S scores to monitor current self-harm high-risk behaviors would help with immediate intervention. Both the K-BSL-23 and K-BSL-S can be used weekly in clinical settings to monitor changes through intervention. The K-BSL-23 cut-off score can be used to screen for probable BPD diagnosis prior to other structured interviews. We expect that the K-BSL-23 and K-BSL-S will facilitate research and practice for people with BPD.

### Funding

This research was supported by a grant of the Korea Health Technology R&D Project through the Korea Health Industry Development Institute (KHIDI), funded by the Ministry of Health & Welfare, Republic of Korea (grant number: HC20C0140).

### Author contributions statement

Jihoon Kang, M.A., conceived the study, analyzed the data, and developed the manuscript. Jae-Woong Kim, M.A., collected the data and revised the manuscript. Jeong-Ho Seok, M.D., Ph.D. and Bon-Hoon Koo, M.D., Ph.D., administered data collection and provided

critical feedback. Jin Sun Ryu, M.D., Hyun-Kyung Shin, M.A., Seok Ho Yun, M.D., Ph.D., and Hye Jung Hong, Ph.D. collected and organized data and provided critical feedback. Hyunjung Choi, Ph.D., conceived the study and revised the manuscript. All authors contributed to the submission of this study and approved the final manuscript.

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