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A short screening tool for borderline personality disorder (Short-Bord): Validated by Rasch analysis

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ABSTRACT

The study aimed to development a short screening scale for borderline personality disorder (Short-Bord), and to validate its psychometric properties using Rasch analysis. Ninety-eight outpatients undergoing psychotherapy were evaluated using a semistructured diagnostic interview for DSM-IV Personality disorders. Correlational analysis and Rasch analysis were used to identify the best-fitted items for the shorter scale. Rasch analysis identified three underfitted items. The best five items were selected for the Short-Bord using two analyses, resulting in two sets of Short-Bord which included item 1 (becoming frantic when someone left), item 2 (up- and-down relationships), item 3 (sudden change of sense of self), item 8 (self-harm or suicide), item 9 (self-mutilation), item 10 (sudden mood change) and item 11 (feeling empty inside). Each set of the five-item Short-Bord were tested against the original 15-item BPD scale. Results showed that both sets of the Short-Bord yielded minimally lower in area under curve (AUC = 0.95 and 0.96, respectively) compared with the total score of 15 items (AUC = 0.97), but none significantly differed (chi-square = 0.89-2.87, df 1, $p > .05$). Internal consistency for the set from Rasch analysis was slightly higher than correlation methods (Cronbach's alpha = 0.80, and 0.78, respectively). The Short-Bord presents promising tool to screen for borderline personality disorder. Its diagnostic validity was comparable to the total 15 items despite completing in a shorter time. The Short-Bord derived from Rasch analysis was, however, preferable as all items were shown to have unidimensional construct with good fit statistics and good internal consistency.

1. Introduction

Among personality disorders, borderline personality disorder (BPD) challenges clinicians and investigators the most in terms of treatment and management, because persons with BPD usually present treatment-resistant mood disorders, such as, major depressive disorder and bipolar disorder (Olabi and Hall, 2010; Angstman et al., 2017; Grilo et al., 2010). BPD is also an important consideration when suicidality is present (Wongpakaran et al., 2019; Garno et al., 2005). BPD relates to impulsivity, suicidal ideation and self-mutilation, and it has predictive validity for depression and other clinical disorders (Links et al., 1995; Rihmer and Benazzi, 2010). The gold standard for a diagnosis of BPD is met when a psychiatrist or trained professional uses a standardized structured interview for personality disorder, e.g., SCID II or International Personality Disorder Examination DSM-IV and ICD-10 interview (IPDE) (First et al., 1995; Loranger et al., 1997). The prevalence of BPD has been found to vary depending on study site, e.g., 6% in the general population (Grant et al., 2008), 15.2% among college students (Shenoy and Praharaj, 2019), and 40% among patients undergoing psychotherapy (Neelapaijit et al., 2017).

Persons with BPD usually seek treatment when they have serious problems such as suicidality, major clinical depression, bipolar disorder or psychotic disorder, and when disability or financial loss threatens. Early identification enables clinicians to provide early intervention. A screening tool is often the first step in diagnosis. Common screening tools for BPD are the McLean Screening Instrument for BPD (MSI-BPD) (Zanarini et al., 2003), the Personality Diagnostic Questionnaire 4th edition—BPD Scale (Hyler, 1994), and the Structured Clinical Interview for DSM-IV Axis II Personality Disorders -Patient Questionnaire—BPD Scale (SCID-II-PQ BPD) (First et al., 1995). The nine criteria of BPD according to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, were measured with the Structural Clinical Interview for DSM-IV Axis II Disorders—BPD scale (First et al., 1995).

Research showed a comparable performance among these three scales (sensitivity 88–94% and specificity 73–84%) (van Alebeek et al., 2017). Another comparison was conducted among outpatient youth using four tools: MSI (Zanarini et al., 2003), SCID-II PQ (First et al., 1995), IPDE (Loranger et al., 1997), and Borderline Personality

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Questionnaire (BPQ) (Poreh et al., 2006). These results showed that sensitivity ranged from 64 to 77%, while the specificity ranged from 75 to 90%. BPQ yielded the highest overall accuracy (0.85) compared to the other three scales (Chanen et al., 2008).

Notably, all five scales are dichotomous, ranging from 9 items (PDQ) to 80 items (BPQ). However, we believe that a screening tool should not be too long because screening is only a first step; the diagnosis itself is to be made by clinicians. We were interested in creating a shorter tool that had psychometric properties comparable to the longer tools. We proposed to develop a scale with fewer items than the original 15-item borderline scale of the SCID-II PQ. To do that we used two approaches, first, to find the best representative items based on the Rasch measurement model and second, to find the items that exhibited the highest correlation with diagnoses made by a psychiatrist. We compared the diagnostic performance of both sets of screening items for borderline personality disorder (Short-Bord) with the original 15-items.

2. Material and methods

This study used a retrospective cross-sectional design. It followed the ethical tenets of the Declaration of Helsinki and was approved by the Institutional Review Board (IRB) of the Faculty of Medicine, Chiang Mai University.

2.1. Participants and procedure

The study included 98 patients who came for psychotherapy at the Psychotherapy and Personality Disorder Clinic and Education Center at Maharaj Nakorn Chiang Mai Hospital, Faculty of Medicine, Chiang Mai University from 2007 to 2019. All were assessed for demographics, clinical disorders (Axis I) and personality disorders (Axis II) the Diagnostic and Statistical Manual of Mental Disorder, Fifth Edition (DSM-5) (APA, 2013). For Axis II, the patient was interviewed by the psychiatrist using DSM-5, for those who were assessed by psychologists and psychiatry residents using SCID-II, the patients were then interviewed further to confirm the Axis II diagnosis by psychiatrists. For inclusion in the present study, subjects had to be 18 years old and higher, having completed data concerning diagnoses of clinical psychiatric disorders and personality disorder using SCID-II (Wongpakaran et al., 2012). Among all, 98 met the criteria and provided data for the analysis.

2.2. Measurements

2.2.1. The structured clinical interview for DSM-IV Axis ii disorders questionnaire (SCID-II PQ)

The SCID-II, a part of the Structured Clinical Interview for DSM-IV Axis II Disorders, is a dichotomous, 200-item self-reported questionnaire usually recommended to be used before an interview. It assesses 12 personality disorders: paranoid PD, schizoid PD, schizotypal PD, narcissistic PD, histrionic PD, antisocial PD, borderline PD, dependent PD, avoidant PD, obsessive-compulsive PD, passive aggressive PD and depressive PD (First et al., 1995). The Thai version was shown to exhibit good inter-rater reliability (Wongpakaran et al., 2012). It contained 15 items for the borderline scale.

2.3. Data analysis

Rasch analysis was conducted using Winsteps® (Version 4.4.5) (Beaverton, Oregon: Winsteps.com). To test whether the data fit the Rasch model, four criteria had to be met. First, to assess the unidimensionality of the scale, principal component analysis (PCA) of the residuals was used. The variance explained by the measurement dimensions was expected to be at least 40%, and the first principal component of the residuals (first contrast) should not be more than 15% or have an Eigen value less than 2 (Embretson and Reise, 2000). The item fit statistics should be 0.7 and 1.3 (Linacre, 2005) and inter-item residual correlations suggesting local independence, should not exceed 0.3, suggesting dependency (Embretson and Reise, 2000). Second, response category functioning ordered categories and thresholds were expected to be measured (Andrich, 2012). Third, reliability of 0.80 or higher was considered acceptable for persons and items. Last, differential item functioning (DIF) was evaluated by a significant DIF Contrast < 0.64, indicating an acceptable value (Linacre, 2017).

Demographic data were presented using descriptive analysis. The internal consistency for the SCID-II PQ was computed using Cronbach's alpha reliability coefficient, and the inter-item correlation was analyzed using Pearson's product moment correlation. The performance of the SCID-II PQ was evaluated by computing the values of sensitivity and specificity for that instrument. Receiver Operator Curve (ROC) analysis was used to obtain information regarding all possible pairs of achievable sensitivity and specificity values for each screening instrument. This analysis also determined the optimal cut-off score for each instrument to obtain the best value of sensitivity and specificity. In comparison diagnostic performance, area under the curve (AUC) was estimated. The Chi-square test between each pair, adjusted by Sidak's method, was used to determine the differences between AUCs. These data analyses were conducted using IBM SPSS, Version 22. (Armonk, NY: IBM Corp., 2013), and Stata 14 (College Station, TX: StataCorp LP; 2015).

3. Results

Most participants were female (69.4%) and the average age was 36.8 years. Most received a diagnosis of mood disorder (71.5%) on Axis I diagnoses, of which depressive disorders predominated. Fifty-seven (58.16%) was diagnosed of BPD. For BPD features, the most common items were feeling empty (58.2%), paranoid or blurred when under pressure (55.1%), self-harm or suicide (51.0%), and up-and-down relationship (50.0%) (Table 1).

Table 2 shows item fit statistics based on the Rasch measurement model. The items that contributed the most to the latent construct of BPD scale were 1 (frantic), 2 (up), 3 (self), 8 (self-harm) and 10 (emotional), yielding a point -measure correlation ranging from 0.66 to 0.73.

In investigating for dimensionality using PCA, the raw variance explained by measures was 38.6%, leaving the raw unexplained variance at 61.4%. The unexplained variance in the first contrast was 8.3% (Eigen value = 2.02), suggesting a potential second dimension. However, when some underfitted and local dependent items, Items 11, 14, 15, and 5, were removed, the data showed a better fit to the Rasch model, increasing the value to 39.7%. The raw unexplained variance was 60.3%. The unexplained variance in the first contrast was 10.9% (Eigen value = 1.81), suggesting unidimensionality. No disordered category and threshold was found, and no DIF because of sex or age was identified.

To examine the items correlated to diagnoses made by a psychiatrist and to analyze how items correlated to each other, Pearson's correlation was used. It showed the items with the highest correlation to diagnosis were 1 (frantic), 8 (self-harm or suicide), 3 (self-instability-awareness), 11 (feeling empty) and 10 (emotional change), presenting a magnitude of correlation ranging from 0.567 to 0.673 (Table 3).

The items from the two methods formed the short screening tool for borderline personality disorder (Short-Bord), which was separated into two sets. Short-Bord from Rasch analysis (Set 1) comprised Items 1, 2, 3, 8 and 10, while Set 2 comprised Items 1, 3, 8, 10 and 11. A post hoc analysis involved comparing the ROC curve against the gold standard of the original 15 items of the SCID-II PQ.

Fig. 1 shows the ROC curve comparison between three sets of items: Total score (15 items) as a reference, Set 1 and Set 2. Total score yielded an AUC of 0.97 with a standard error of 0.018; Set 1 yielded an AUC of 0.95 with a standard error of 0.021, and Set 2 yielded an AUC of 0.96

Table 1
Demographic and clinical data.

Variables	N(%) or Mean (SD)
Age (year)	37.04(13.5)
Sex, %Female	65.4
Education level	
Elementary	3(3.7)
High school	6(7.4)
Bachelor	61(75.3)
Master or higher	11 (13.6)
Marital status	
Live alone	52(64.2)
Live with others	29(35.8)
Clinical disorders (Axis I)	
Major depressive disorder	35(43.2)
Persistent depressive disorder (dysthymia)	10(12.3)
Mixed anxiety and depressive disorders	7(8.6)
Adjustment disorder	7(8.6)
Bipolar disorder	6(7.4)
Generalized anxiety disorder	4(4.9)
Panic disorder	3(3.7)
Others	9(11.1)
Borderline Personality Disorder features	
1. becoming frantic when someone left	42(42.9)
2. up-and-down relationships	49(50.0)
3. sudden change of sense of self	40(40.8)
4. dramatic change of sense of self	32(32.7)
5. unstable sense of self	34(34.7)
6. sudden change in personal goals	29(29.6)
7. impulsivity	32(32.7)
8. self-harm or suicide	50(51.0)
9. self-mutilation	28(28.6)
10. sudden mood change	46(46.9)
11. feeling empty inside	57(58.2)
12. temper outbursts	29(29.6)
13. hitting people or throwing things when angry	13(13.3)
14. becoming angry easily	37(37.8)
15. becoming paranoid or blurred when under stress	54(55.1)

Table 2
Rasch fit statistics.

Item	Model measure	MNSQ		Point-measure correlation
		Infit	Outfit	
13. hitting people or throwing things when angry	2.4	0.92	0.57	0.5
5. unstable sense of self	0.26	1.22	1.30	0.55
14. becoming angry easily	0.11	1.21	1.39	0.56
9. self-mutilation	0.75	1.06	0.99	0.58
15. becoming paranoid or blurred when under stress	−1.28	1.23	1.41	0.61
6. sudden change in personal goals	0.66	0.95	1.15	0.61
11. feeling empty inside	−1.52	1.11	1.57	0.63
4. dramatic change of sense of self	0.42	0.98	0.83	0.63
12. temper outbursts	0.66	0.83	1.03	0.64
7. impulsivity	0.5	0.87	1.00	0.65
1. becoming frantic when someone left	−0.35	1.00	0.9	0.66
2. up-and-down relationships	−0.88	1.00	1.00	0.67
3. sudden change of sense of self	−0.2	0.86	0.75	0.69
8. self-harm or suicide	−0.88	0.88	0.78	0.71
10. sudden mood change	−0.65	0.77	0.68	0.73

MNSQ = mean-square.

with a standard error of 0.019. No significant difference was found between each pair (the Chi-square test between the first pair was 2.866, df 1, adjusted p-value = 0.1727; while the second pair was 0.890, df 1, adjusted p-value = 0.5716).

For total score (15 items), sensitivity was 96.5% and specificity was 92.7% determined by a cut-off ≥5. For Set 1, sensitivity was 91.2% and specificity was 85.4% determined by a cut-off ≥2, and for Set 2, sensitivity was 96.5% and specificity was 85.4% determined at the cut-off ≥2. Finally, the Cronbach's alpha for total score, Set 1 and Set 2 was 0.896, 0.806 and 0.782, respectively.

4. Discussion

The objective of the present study was to identify the best items to include in a shorter screening scale for BPD (Short-Bord). Two methods of analysis were applied for selecting the best representative items in the shorter version of the BPD scale of the SCID- II PQ. Conceivably, items with the highest correlation with the reference (diagnoses made by a psychiatrist) would yield the greatest diagnostic accuracy. However, in comparing two sets of Short-Bord, we preferred the first set derived from Rasch analysis, i.e., Items 1 (becoming frantic when someone left), 2 (up-and-down relationships), 3 (sudden change of a sense of self), 8 (self-harm or suicide) and 10 (sudden mood change), despite the fact that it was slightly lower in AUC than Set 2. Moreover, all the items in Set 1 demonstrated their contribution to the unidimensional construct by illustrating good fit statistics and good internal consistency. Item 11 (feeling empty inside) seemed to be a key item for giving Set 2 a higher AUC than Set 1. From the point of view of the Rasch model, Item 11 was able to discriminate between high and low performers less than expected for an item of this difficulty (high discrimination) (Linacre, 2017). However, Item 11 was underfit (MNSQ > 1.30), indicating that those who did not have borderline PD, but other PDs, e.g., antisocial, schizotypal or major depressive disorders, would have mistakenly endorsed this item. In addition, Item 11 together with some other items (details not shown in results) formed another competitive dimension, which violated the measurement principle; hence, using the sum score for cut-off may be unjustified.

This Short-Bord is probably the shortest scale for screening BPD. Other scales include the short version of the Borderline Symptom List (23 items) (Bohus et al., 2009), MSI (10 items) (Zanarini et al., 2003), PDQ-4 BPD (9 items) (Hyler, 1994), the BPD Scale of the SCID-II-PQ (15 items), the borderline scale of IPDE (10 items) (Loranger et al., 1997) and the Borderline Personality Questionnaire (BPQ) (80 items) (Poreh et al., 2006).

Regarding the content of the BPD Scales, Poreh et al. (2006) revealed that affective instability and feeling emptiness yielded the high loadings among US, English and Australian samples. While Zimmerman et al. (2019), used all nine items of diagnostic criteria for DSM-IV and revealed that 'emotional change' is a vital item because it captures almost all major clinical disorders, e.g., MDD, bipolar disorder and no MDD/bipolar disorder. In an Asian population, Shenoy and Praharaj (2019) discovered high rates of comorbid bipolar spectrum disorder and binge-eating disorder with borderline personality, but particular items with high contribution to the clinical disorders have not been mentioned in this study. Up-and-down relationship, was also noted among Asians and the present sample which may have contributed to vulnerabilities related to social cognition deficits (Anupama et al., 2018). However, none has reported a scale with fewer than nine items (9 diagnostic criteria); thus, making it difficult to compare with the present study. Further investigation may be needed. Limitations are - the prevalence of BPD in the test sample was quite high, which could have affected the diagnostic accuracy of the scale. Implementing the Short-Bord with other populations, especially youth or students, should be encouraged. Test-retest reliability should be further examined to ensure Short-Bord has temporal stability. Also, external validity, e.g., concurrent validity, with other measurements should be further conducted. The strength of this study was that all participants received confirmation by a psychiatrist. In addition, the use of Rasch analysis ensured that the items selected made sufficient contributions to the borderline personality.

Table 3
Correlation between SCID-II item and diagnosis made by a psychiatrist.

Item	Dx	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. becoming frantic when someone left	**.567****	1														
2. up- and- down relationships	.559**	.536**	1													
3. sudden change of sense of self	**.578****	.414**	.498**	1												
4. dramatic change of sense of self	.458**	.320**	.348**	.617**	1											
5. unstable sense of self	.488**	.322**	.300**	.398**	.498**	1										
6. sudden change in personal goals	.459**	.342**	.291**	.371**	.454**	.326**	1									
7. impulsivity	.414**	.496**	.435**	.396**	.211*	.224*	.454**	1								
8. self-harm or suicide	**.576****	.354**	.408**	.481**	.421**	.285**	.412**	.421**	1							
9. self-mutilation	.445**	.320**	.361**	.486**	.330**	.251*	.332**	.330**	.620**	1						
10. sudden mood change	**.673****	.425**	.532**	.425**	.435**	.474**	.510**	.479**	.472**	.401**	1					
11. feeling empty inside	**.581****	.400**	.476**	.410**	.370**	.401**	.278**	.238*	.369**	.216*	.425**	1				
12. temper outbursts	.550**	.478**	.335**	.417**	.311**	.232*	.461**	.550**	.456**	.481**	.510**	.278**	1			
13. hitting people or throwing things when angry	.271**	.269**	.211*	.287**	.305**	.031	.340**	.497**	.323**	.152	.356**	.210*	.406**	1		
14. becoming angry easily	.362**	.346**	.358**	.338**	.131	.273**	.233*	.490**	.384**	.160	.406**	.191	.417**	.316**	1	
15. becoming paranoid or blurred when under stress	.482**	.326**	.246*	.332**	.410**	.313**	.316**	.235*	.388**	.298**	.438**	.399**	.316**	.111	.238*	1

Dx = diagnosis made by psychiatrist, * p < .05, **p < .01.
Top five correlation coefficient values are in bold.

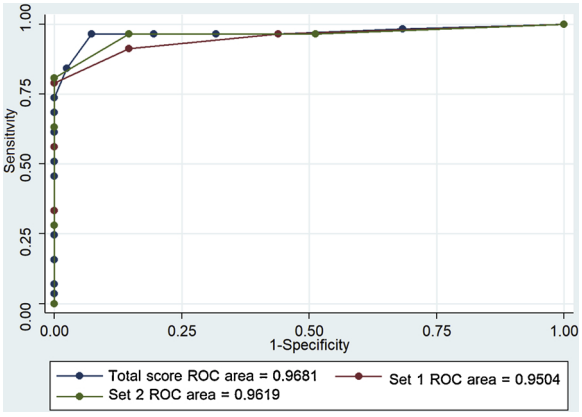

Fig. 1. Comparison of ROC area among three sets of scale.
ROC = Receiver operating characteristic.

5. Conclusion

This short screening tool for borderline personality disorder (Short-Bord) was shown to have a unidimensional construct with good fit statistics and good internal consistency. In addition, its diagnostic validity was shown to be comparable to the total score of 15 items, while taking less time to complete.

Author contributions

All authors have contributed to conception and participated in the design of the protocol. NW and TW drafted the manuscript and approved the final version.

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None.

Declaration of Competing Interest

The author reports no conflicts of interest in this work.

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