

Psychometric Properties and Factor Structure of the Behavior Problems Inventory in Iranian Elementary Students with Intellectual Disability

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ABSTRACT

Objective: This study aimed to evaluate the psychometric properties and the factor structure of the Behavior Problems Inventory (BPI-01) among students with intellectual disabilities in Iran.

Methods: The Persian version of BPI-01 was administered to the care staff of Iranian children and adolescents (n=591) who had been detected as suffering from intellectual disabilities. Iranian children and adolescents with intellectual disabilities in the present study lived in one of the 4 provinces of Tehran, Esfahan, Karaj, and Kurdistan. Cronbach α and confirmatory factor analysis (CFA) were used for analyzing the data.

Results: The results of the study showed that the scale could reach an acceptable level of internal consistency (Cronbach α ranged from 0.83 to 0.94). Furthermore, CFA supported the unidimensionality of the subscales as well as 3 factor structure proposed in the original BPI-01.

Conclusion: The Persian version of BPI-01 enjoys an acceptable level of reliability and is explained by the same factor structure proposed in the original BPI-01. The limitations and some applications of the present study will be discussed too.

1. Introduction

Individuals with intellectual disabilities (IDs) have a tendency to develop serious behavior challenges during the course of their life-time. These challenges are often manifested as self-injurious behavior, attacking others, destructive behavior, and repetitive stereotypic behavior. In addition to being an immediate threat of physical harm, these behaviors have indirect effects and implications such as curtailing personal and social development, jeopardizing community based living arrangements, and

severely restricting person's quality of life (Gardner & Moffatt, 1990; Bushbacher & Fox, 2003).

A variety of rating scales have been developed for assessing problem behaviors. Some of those instruments are broad band and capture a wide spectrum of behavioral and psychopathological domains. Good examples of such broad band instruments are Aberrant Behavior Checklist (ABC; Aman, Singh, Stewart, & Field, 1985a, 1985b, 1995), Developmental Behavior Checklist (DBC; Einfeld & Tonge, 2002), and Nisonger Child Behavior Rating Form (NCBRF; Aman, Tassé, Rojahn, & Hammer 1996). Other instruments are single domain

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instruments. For instance, assessment of compulsive and repetitive behaviors include the Repetitive Behavior Scale-Revised (RBS-R; Bodfish, Symons, & Lewis, 1999), Repetitive Behavior Questionnaire (RBQ-2; Leekam et al., 2007), Repetitive Behavior Questionnaire (RBQ; Moss et al., 2009), and Behavior Flexibility Rating Scale Revised (BFRS-R; Peters-Scheffer et al., 2008). Examples of the assessment instruments for aggressive behavior are the Adult Scale of Hostility and Aggression: Reactive/Proactive (A-SHARP; Matlock & Aman, 2011) and Children's Scale of Hostility and Aggression: Reactive/Proactive (C-SHARP; Farmer & Aman, 2009).

Rojahn and colleagues worked for many years with a checklist of behavior problems, which they developed into BPI-01 (Rojahn et al., 2001) that is one of the most salient specialized structural behavior assessment scales for people with IDs. The BPI-01 is an informant-based scale designed to be used in different contexts such as clinical assessments, treatment evaluations, and epidemiological microanalyses. BPI-01 consists of 3 subscales for the assessment of self-injurious behaviors, stereotypical behaviors, and aggressive/destructive behaviors.

In an assessment of 432 individuals with IDs living in a large developmental center (Rojahn et al., 2001), the inter-interviewer reliability, test-retest reliability, and internal consistency of the 3 subscales as well as full BPI-01 were found to be acceptable. The reliability of BPI-01 has been confirmed in studies, including institutional-based (Gonzalez et al., 2009) and community-based adult samples (Van Ingen, Moore, Zaja, & Rojahn, 2010). A closer inspection of recent studies examining internal consistency of BPI-01 (Gonzalez et al., 2009; Lambrechts, Kuppens, & Maes, 2009; Mircea, Rojahn, & Esbensen, 2010; Rojahn et al., 2001; Rojahn, Wilkins, Matson, & Boisjoli, 2010; Van Ingen, Moore, Zaja, & Rojahn, 2010) reveals that the overall internal consistency of BPI-01 is acceptable, however, the internal consistency of three subscales varies, with the self-injurious behavior scale generally evaluated to have the lowest consistency among the subscales.

Using confirmatory factor analysis (CFA), the studies by Gonzalez et al. (2009) and Rojahn et al. (2010) give support to the proposed 3 factor structure of BPI 01. In addition, the psychometric quality of BPI-01 has been demonstrated in other languages such as Dutch (Lambrechts, Kuppens, & Maes, 2009) and Romanian (Mircea, Rojahn, & Esbensen, 2010). BPI-01 has been also translated into Swedish and used to assess the effects of interventions to reduce self-injurious behaviors (Lun-

dqvist, Andersson, & Viding, 2009). The results indicate that BPI-01 is sufficiently sensitive to detect changes and is therefore usable for intervention evaluation.

Yet, there has been no validation of the factor structure of BPI-01 in Iran. Thus, it is not known whether the three factor model of BPI-01 is generalizable to the population of Iranian students with intellectual disabilities. Moreover, in clinical situations, there is no suitable measure with acceptable psychometric properties, for the assessment of behavioral problems that Iranian students with intellectual disabilities suffer from.

The present study aimed to evaluate the psychometric properties and the factor structure of the Iranian version of BPI-01, based on data from Iranian students who had been detected as suffering from intellectual disabilities. Iranian children and adolescents with intellectual disabilities in the present study lived in one of the four provinces of Tehran, Isfahan, Karaj and Kurdistan.

2. Methods

This study is descriptive, that investigates psychometric properties of the BPI-01 using correlation based methods. Five hundred and ninety-one (392 male, 199 female) participants were recruited from young student population with intellectual disability. Their ages ranged from 3 to 26 years, with a mean age of 10.74 years ($SD=3.99$). According to the clinical practice in Iran, the participants were classified into having a mild (40.3%), moderate (46.4%), severe (12.5%), or profound (0.8%) level of mental retardation. The most frequent diagnoses were Down's syndrome (43.5%), autism (33.2%), mentally retarded (13.4%), and other disorders (10%).

BPI-01 (Rojahn et al., 2001) with additional background questions was used. BPI-01 is a 49-item informant-based rating scale for behavior problems in individuals with IDs. It has 3 subscales that have been validated by CFA and found to be reasonably reliable (Rojahn et al., 2001). They are as follows: Self-injurious behavior (14 items), stereotyped behavior (24 items), and aggressive/destructive behavior (11 items). In addition, each category has a residual item for behaviors not listed but meeting the generic behavior problem definition given for each of the 3 subscales. To be rated, the behavior must have occurred at least once during the previous 2 months. Each item is scored on two scales: A 5-point frequency scale (from never=0, through hourly=4) and a 4-point severity scale (from no problem=0, through severe problem=3). The Persian translation of BPI-01 was used in this study. BPI-01 was translated into Persian by two professional

translators. Then, the translations were compared. A few emerged discrepancies consisted mainly of different choices of synonymous words or sentence structures.

The participants of the study were children and adolescents enrolled in exceptional-children schools in Iran. They were selected using a convenient sampling approach from 4 provinces (Tehran, Esfahan, Alborz, and Kurdistan). In each province, after getting permission from authorities (Ministry of Education in each city), the head teachers were contacted in order to coordinate the data collection procedure. Then, after training the head teacher about BPI-0, the teachers were asked to complete a paper-and-pencil version of the final draft of the Persian version of BPI-01 for each student while one of researchers was always present in the school for any assistance or inquiries. The research data were collected in about one month.

Internal consistency of the factors was examined using Cronbach α . The α coefficients of 0.70 and higher were considered adequate reliability (Nunnally & Bernstein, 1994). Given the priori proposed 3 factor model of the BPI-01, a 3-factor confirmatory model was specified. LISREL 9.1 was used to examine the variance-covariance matrix of the sample data. Because the measurement variables were nonnormal; the parameters were estimated by the robust maximum likelihood (RML) method (Brown, 2006). Indices of model fit included the Satorra-Bentler scaled chi-square test, the chi-square to degrees of freedom ratio (χ^2/df), standardized root mean square residual (SRMR), comparative fit index (CFI), and the root mean square of approximation (RMSEA). Values lower than 3.0 for chi-square to degrees of freedom ratio, close to 0.08 for the SRMR, close to 0.95 for the CFI, and close to 0.06 for the RMSEA were considered for the adequate fit. (Hu & Bentler, 1999).

Table 1. Means, corrected item total correlations, and factor loadings of the Behavior Problems Inventory (BPI-01), frequency and severity scores.

Item no.	Frequency			Severity		
	Mean	I-T correlation*	Loading	Mean	I-T correlation	Loading
BPI-01	21.42			16.70		
SIB	3.31			2.63		
1. Self-biting	0.31	0.60	0.67	0.27	0.56	0.63
2. Head hitting	0.48	0.64	0.75	0.37	0.60	0.69
3. Body hitting	0.42	0.69	0.78	0.32	0.67	0.75
4. Self-scratching	0.15	0.44	0.49	0.12	0.44	0.48
5. Vomiting	0.15	0.39	0.39	0.14	0.40	0.40
6. Self-pinching	0.16	0.47	0.52	0.13	0.44	0.48
7. Pica	0.27	0.51	0.52	0.21	0.53	0.55
8. Stuffing objects	0.10	0.36	0.39	0.09	0.34	0.37
9. Nail pulling	0.16	0.39	0.42	0.12	0.39	0.43
10. Poking	0.17	0.39	0.42	0.12	0.41	0.45
11. Aerophagia	0.09	0.31	0.32	0.07	0.31	0.33
12. Hair pulling	0.26	0.51	0.55	0.22	0.50	0.54
13. Drinking	0.29	0.33	0.34	0.23	0.39	0.41
14. Teeth grinding	0.31	0.40	0.46	0.24	0.44	0.50
15. SB	13.62			10.3		
16. Rocking	0.81	0.65	0.67	0.63	0.66	0.68
17. Sniffing objects	0.47	0.50	0.51	0.35	0.53	0.54
18. Spinning	0.42	0.66	0.67	0.33	0.67	0.69

Item no.	Frequency			Severity		
	Mean	I-T correlation*	Loading	Mean	I-T correlation	Loading
19. Waving arms	0.48	0.62	0.64	0.37	0.64	0.67
20. Head rolling	0.55	0.53	0.56	0.42	0.57	0.60
21. Whirling	0.43	0.61	0.62	0.34	0.64	0.66
22. Body movements	0.89	0.70	0.74	0.65	0.72	0.76
23. Pacing	0.95	0.50	0.50	0.68	0.52	0.52
24. Twirling	0.51	0.60	0.61	0.39	0.54	0.55
25. Hand movements	0.85	0.70	0.74	0.61	0.70	0.75
26. Yelling	0.88	0.56	0.58	0.70	0.56	0.59
27. Sniffing self	0.24	0.41	0.42	0.18	0.44	0.45
28. Bouncing	0.55	0.54	0.54	0.42	0.51	0.51
29. Spinning	0.35	0.55	0.55	0.29	0.57	0.56
30. Running	0.48	0.50	0.51	0.39	0.53	0.52
31. Finger movements	0.45	0.61	0.64	0.33	0.61	0.64
32. Manipulating	0.65	0.58	0.58	0.52	0.59	0.58
33. Sustained finger	0.39	0.63	0.67	0.28	0.63	0.66
34. Rubbing self	0.30	0.61	0.63	0.24	0.60	0.62
35. Gazing	0.68	0.57	0.60	0.51	0.58	0.61
36. Postures	0.43	0.52	0.54	0.33	0.54	0.56
37. Clapping	0.54	0.68	0.70	0.41	0.70	0.72
38. Grimacing	0.58	0.49	0.51	0.39	0.49	0.50
39. Hand waving	0.72	0.74	0.79	0.54	0.73	0.77
40. ADB	4.49			3.77		
41. Hitting others	0.72	0.71	0.76	0.59	0.71	0.78
42. Kicking others	0.45	0.68	0.71	0.38	0.65	0.71
43. Pushing	0.64	0.71	0.75	0.54	0.72	0.78
44. Biting	0.18	0.55	0.64	0.16	0.51	0.58
45. Grabbing pulling	0.40	0.65	0.73	0.34	0.66	0.72
46. Scratching	0.18	0.59	0.66	0.17	0.59	0.63
47. Pinching	0.27	0.59	0.66	0.23	0.57	0.61
48. Spitting	0.22	0.52	0.52	0.19	0.51	0.51
49. Being verbally abusive	0.57	0.42	0.43	0.46	0.46	0.48
50. Destroying things	0.35	0.40	0.43	0.31	0.40	0.43
51. Cruel behavior	0.50	0.54	0.56	0.40	0.57	0.59

* I-T correlation: Corrected item-total correlation.

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ADB=Aggressive/ destructive behavior; SB=Stereotyped behavior; SIB=Self-injurious behavior.

3. Results

Means, corrected item-total correlation, and factor loadings of BPI-01 are presented in Table 1. The mean of BPI-01 for frequency and severity was 21.42 and 16.70, respectively. Regarding the self-injurious behavior, the mean was 3.31, mean of items ranging from 0.09 (item 11) to 0.48 (item 48) for frequency, and from 0.07 (item 11) to 0.37 (item 2) for severity. With regard to the stereotyped behavior, the mean was 13.62, mean of items ranging from 0.24 (item 27) to 0.95 (item 23) for frequency, and from 0.18 (item 44 and 46) to 0.70 (item 41) for severity. Regarding the aggressive/destructive behavior, the mean was 4.49, mean of items ranging from 0.24 (item 27) to 0.72 (item 41) for frequency, and from 0.40 (item 50) to 0.71 (item 41) for severity. Cronbach α was calculated for internal consistency of the frequency and severity data. BPI-01 full scale had an α of 0.94 for the frequency scale and 0.94 for the severity scale. The subscales had frequency and severity α scales of 0.83 and 0.83 for self-injurious behavior, 0.93, and 0.94 for stereotyped behavior, and 0.87 and 0.87 for aggressive/destructive behavior, respectively. All scales had an adequate internal consistency. Item correlation coefficients greater than 0.30 were retained for each factor (Field, 2005). The item total correlations of frequency of self-injurious behavior subscale ranged from 0.31 (item 11) to 0.69 (item 3), and severity scores ranged from 0.31 (item 11) to 0.67 (item 3). Regarding the stereotyped behavior subscale, the frequency scores

ranged from 0.41 (item 27) to 0.74 (item 39), while the severity scores ranged from 0.44 (item 27) to 0.73 (item 39). Regarding the aggressive/destructive behavior subscale, the frequency scores ranged from 0.40 (item 50) to 0.71 (items 41 and 44), and the severity scores ranged from 0.40 (item 50) to 0.72 (item 43).

The unidimensionality of each subscale was assessed by fitting a single factor model to the data from each subscale by means of confirmatory factor analysis. Fit indices for total BPI.01 and subscales are shown separately for frequency and severity scores in Table 2. Satorra-Bentler chi-square tests for the unidimensionality of subscales were significant in all cases, indicating that a significant proportion of the data remains unexplained by the model. However, a significant chi-square should not lead to the rejection of the model as this can be an artifact of sample size and small variations in data (Hu and Bentler, 1995). χ^2/df values ranged from 2.26 to 5.13. χ^2/df fit index suggests adequate model fit for self-injurious behavior, however χ^2/df for stereotyped behavior and aggressive/destructive behavior subscales was greater than 3, suggesting a poor model fit. Other fit indices such as the standardized root mean square residual (SRMR) ranged from 0.067 to 0.08, comparative fit index (CFI) ranged from 0.97 to 0.98, and the root mean square of approximation (RMSEA) ranged from 0.046 to 0.084 suggest that unidimensionality is tenable.

Table 2. CFA goodness-of-fit indices of the Behavior Problems Inventory (BPI-01).

Scale	S-B χ^2	df	χ^2/df	RMSEA	RMSEA-90% CI	SRMR	CFI
Frequency							
SIB	174.01**	77	2.26	0.046	0.037 to 0.055	0.0715	0.98
SB	953.569**	252	3.78	0.069	0.064 to 0.073	0.0680	0.97
ADB	226.146**	44	5.13	0.084	0.073 to 0.094	0.0802	0.97
Total BPI.01	2632.75**	1124	2.34	0.048	0.048 to 0.050	0.0791	0.97
Severity							
SIB	204.888**	77	2.66	0.053	0.044 to 0.062	0.0788	0.97
SB	967.595**	252	3.83	0.069	0.065 to 0.074	0.0673	0.97
ADB	217.371**	44	4.94	0.082	0.071 to 0.092	0.0794	0.97
Total BPI.01	2642.975**	1124	2.35	0.048	0.045 to 0.050	0.0799	0.97

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Note: ADB=Aggressive/destructive behavior; SB=Stereotyped behavior; SIB=Self-injurious behavior; S-B χ^2 =Satorra-Bentler chi-square; RMSEA=Root mean square error of approximation; CI=Confidence interval; SRMR=Standardized root mean square residual; CFI=Comparative fit index.

** $P > 0.01$.

Since all 3 subscales of BPI-01 met the standards for representing unidimensional constructs, a CFA was conducted separately for the frequency and severity of the scores to test the full a priori 3 factor model of BPI-01. With regard to frequency scores, Satorra–Bentler chi-square was significant, but other fit indices, including χ^2/df , SRMR, CFI, and RMSEA indicated excellent model fit. The correlation coefficients among the subscales were large to moderate ($r_{SIB-SB}=0.74$, $r_{SIB-ADB}=0.47$, and $r_{SB-ADB}=0.38$). All factor loadings were significant, ranging from 0.32 (item 11) to 0.78 (item 3) (Table 1). With regard to severity scores, all fit indices indicated an excellent model fit, except Satorra–Bentler chi-square. The correlation coefficients among the subscales were large to moderate ($r_{SIB-SB}=0.75$, $r_{SIB-ADB}=0.47$, and $r_{SB-ADB}=0.38$). All factor loadings were significant, ranging from 0.33 (item 11) to 0.78 (item 41 and 43) (Table 1). Consequently, a priori model with 3 primary factors was regarded as an acceptable representation of the factor structure of the BPI-01 frequency and severity domains.

4. Discussion

The present study principally aimed to evaluate the psychometric properties and the factor structure of the Persian version of BPI-01. Particularly, the study was set to determine whether the proposed 3-factor structure of the BPI-01 would hold plausible in an Iranian student population with intellectual disabilities.

The findings of the study demonstrated that the internal consistencies for BPI-01 severity and frequency (i.e. the full scale) were excellent. Furthermore, internal consistencies for the subscales of the Persian version of BPI-01 ranged from good (SIB and ADB) to excellent (SB).

The fit indices showed that the proposed 3-factor model fitted the data well; this factor model is comparable with the findings of the previous studies (Gonzalez et al., 2009; Lundqvist, 2009; Rojahn et al., 2001; Rojahn & Wilkins et al., 2010; Rojahn et al., 2012). All of the item loadings were significant, which shows the convergent validity of the items. Furthermore, consistent with the previous studies (Lundqvist, 2009; Rojahn et al., 2001), the correlations between the subscales were found to be moderate ($r_{SIB-ADB}$ & r_{ADB-SB}) to high (r_{SIB-SB}). Despite the large correlation between SIB and SB subscales, it was decided to keep them separate in the Persian version of BPI01- because they clinically represent very different issues and should be distinguished in assessment (Rojahn et al., 2001).

The first limitation of this study was the data that were collected from the teachers only and, therefore, were restricted to teacher's knowledge of the students' behaviors in the school. Another limitation the study type that was carried out on elementary students/the youth with intellectual disability the majority of them suffered from severe or profound mental retardation. For further research, it is suggested that studies using parents rating, as well as teacher rating, could provide us a deeper understanding of behaviors of children with intellectual disabilities.

In summary, a strong claim can be put forward that the Persian version of BPI-01 is a valid and reliable measure for the evaluation of behavioral problems (self-injurious behavior, stereotyped behavior, and aggressive/destructive behavior) among students with intellectual disabilities in Iran. Similarly, the measure would be useful for analytic epidemiology or for administrative decision-making as far as common behavioral problems are concerned. Finally, the measure can be of much use for monitoring changes of existing behavior problems and the emergence of new behaviors in clinical situations.

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