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Criterion-related validity of the PDDBI: Comparison with the ADOS-2



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ABSTRACT

The Pervasive Developmental Disorder Behavior Inventory (PDDBI) was developed to measure response to intervention in children diagnosed with Autism Spectrum Disorder (ASD), as well as to aid in diagnosis for clinical and research purposes. This study examined criterion related validity of the PDDBI through comparison with the Autism Diagnostic Observation Schedule-Second Edition (ADOS-2) in 104 children ages 2–11 years. A positive relationship between the PDDBI Autism Composite and all ADOS-2 scores, as well as some subscale correlations, supported convergent validity of the PDDBI as a measure of ASD symptomatology. Additionally, a significant negative relationship between PDDBI adaptive subscales and ADOS-2 scores reinforced divergent validity. These results add to the literature on the validity of the PDDBI as a measure of ASD symptoms.

1. Introduction

The Pervasive Developmental Disorder Behavior Inventory (PDDBI) was developed as a tool to measure response to intervention in children diagnosed with Autism Spectrum Disorder (ASD), as well as to aid in diagnosis for clinical and research purposes (Cohen et al., 2010; Cohen & Sudhalter, 2005). The assessment has several distinctive qualities including age and norm-referenced scores, assessment of both adaptive and maladaptive behaviors, teacher and caregiver forms, as well as an age-standardized Autism Composite providing an overall measure of autism related symptoms. While the development of assessment tools to measure the effectiveness of early intervention has been hampered by the use of highly variable outcome measures (McConachie et al., 2015; Shumway et al., 2012), the PDDBI is one of the very few ASD assessment tools that can track response to treatment over time (Cohen, 2014).

Despite these assets, the PDDBI is not utilized as often in clinical and research capacities compared to other commonly used diagnostic assessment tools (Falkmer, Anderson, Falkmer, & Horlin, 2013), such as the ADI-R (Lord, Rutter, & Le Couteur, 1994) and ADOS (Lord, Rutter, DiLavore, & Risi, 1999). While the ADOS is considered one of the best assessment tools for obtaining an ASD diagnosis, it is not designed to assess response to an intervention (Fletcher-Watson & McConachie, 2017), even with the newer calibrated scores of severity (Gotham, Pickles, & Lord, 2009). Falkmer et al. reviewed a variety of diagnostic assessments for ASD and how often they are included in research. The PDDBI was used in four studies, with three of them authored by the creator of the tool, compared to the ADOS in 24 studies, with nine authored by the creator of the tool. Several studies have used the PDDBI more recently, particularly in examining treatment efficacy. For example, the PDDBI Autism Composite was utilized as an outcome measure of autism severity in a study examining omega-3 fatty acids in the treatment of young children with autism (Mankad et al.,

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2015). The PDDBI was also used as an outcome measure of social communication behaviors in individuals with ASD (Anagnostou et al., 2015). The PDDBI was more recently used to track changes in maladaptive behaviors over time in a study evaluating a multidisciplinary approach to ASD treatment (Hewitson et al., 2016). A screening version of the PDDBI comprising a shorter 18-item parent questionnaire (Cohen, 2011), was recently used to assess social deficit symptom severity in a study of 2–7 year old children with ASD to assess the impact of dietary patterns and nutrient intake on the GI microbiota (Berding, Holscher, Arthur, & Donovan, 2018).

The validity of the PDDBI has been examined in a small number of studies. Diagnostic validity of the PDDBI was investigated in 73 children ages 2–5 years (Cohen et al., 2010). Differences in PDDBI scores were compared across diagnostic classifications of autism, PDD-NOS, and non-spectrum, as determined by the ADOS-G and ADI-R criteria. Results indicated significant differences in PDDBI scores in the autism and PDD-NOS groups compared to the non-spectrum group. The domain and composite scores measuring social communication and the Autism Composite showed the most sensitivity. Overall results supported the use of the PDDBI in differential diagnosis of ASD (Cohen et al., 2010). Use of the PDDBI as a Level II screener in differentiating children with ASD from those with other developmental conditions was also examined (Cohen et al., 2016). Results were positive for parent reported PDDBIs as being sensitive to identifying ASD.

Diagnostic validity of the PDDBI has also been evaluated in 84 children ages 3–12 years (Reel, Lecavalier, Butter, & Mulick, 2012). PDDBI subscales, Autism Composite and total scores were compared across children with ASD and children with other disabilities. Group differences were found on the total score and only one subscale, the Social Pragmatic Problems (SOCPP). The Autism Composite did not show good sensitivity or specificity across diagnoses. Differences in results from that of the previous study (Cohen et al., 2010) were thought to be likely due to differences in participant characteristics and matching procedures, although authors concluded that the findings were not supportive of the diagnostic use of the PDDBI.

Criterion related validity of the PDDBI has been previously assessed (Cohen, 2003). In this study, adaptive and maladaptive subscales of the PDDBI were compared to other established rating scales in 84 children ages 3–6 years. Participants met autism criteria on either the ADI-R or ADOS. The authors reported moderate correlations between the PDDBI Autism Composite and other diagnostic measures including the ADI-R and the Childhood Autism Rating Scale (CARS) supporting convergent validity of the PDDBI. Differences in how the ADI-R and CARS are scored, as well as what aspects of autism they measure, were identified as possible reasons for the correlation not being higher. Strong correlations were found between the adaptive PDDBI subscales and the adaptive measures used for comparison, the Vineland and the Griffiths, suggesting these scales on the PDDBI provide a valid measure of adaptive levels of functioning. Maladaptive scales on the PDDBI were correlated with several maladaptive scales on the Nisonger Child Behavior Rating Form further supporting criterion validity (Cohen, 2003).

More recently, criterion related validity of the PDDBI was analyzed in 40 children, ages 3–7 years, across related measures (McMorris & Perry, 2015). In this study, the authors replicated and extended previous validation studies of the PDDBI (Cohen, 2003; Cohen et al., 2010; Reel et al., 2012) by looking at both convergent and divergent validity, as well as the diagnostic validity of the PDDBI. Results indicated that adaptive scale scores on the PDDBI were moderately correlated with related measures of cognitive and adaptive ability. One unexpected result was a lack of correlation between the maladaptive scales and the Autism Composite scores with the CARS suggesting poor convergent validity (McMorris & Perry, 2015). This finding was also contrary to previous research that suggested a strong correlation with the CARS (Cohen, 2003; Cohen et al., 2010), although the two measures assess different aspects of autism and severity. The authors also found a lack of group differences in the Autism Composite across diagnostic categories, similar to the study by Reel and colleagues (Reel et al., 2012) but contrary to previous findings (Cohen, 2003; Cohen et al., 2010). Due to conflicting findings, the authors stressed the importance of future research further examining the criterion validity of the PDDBI.

Finally, a recent cross-sectional analysis of PDDBI data, from 110 participants ages 1.5–6.9 years, was analyzed with a classification and regression tree algorithm (Cohen & Flory, 2019). A decision tree was developed that detected three behaviorally distinct ASD subgroups: minimally verbal, verbal, and atypical. These subgroups differed in PDDBI profiles and in factors previously reported to be predictors of autism severity and adaptive behavior trajectories. By retrospectively analyzing the trajectories of adaptive skills and autism severity in the three subgroups defined by the decision tree, the authors confirmed predictions that each subgroup had distinct trajectories that varied with the type of adaptive behavior assessed. The PDDBI, together with the decision tree, may have prognostic value that could be helpful for both clinical and research applications by decreasing behavioral heterogeneity and in establishing meaningful subgroups within the overall autism spectrum, as well as providing guidance for intervention (Cohen & Flory, 2019).

The purpose of this study was to extend findings of previous studies examining criterion related validity of the PDDBI via comparison with the ADOS-2. Previous findings have been mixed, and have yet to use the ADOS-2. If criterion validity is supported, it will further establish the use of the PDDBI as a useful tool for assessment of ASD symptoms in research and clinical practice.

2. Methods

2.1. Participants

Participants were recruited from an outpatient multi-disciplinary autism center and informed consent was obtained from the parent or guardian. Participants were 89 males (86%) and 15 females (14%) ages 2–11 years, with a mean (S.D) age of 6.05 (2.16) years. Ethnicity data was available for 85 (81%) subjects and was as follows: 53 (51%) White, 21 (20%) Hispanic, 5 (5%) African American, 4 (4%) Asian/Pacific Islander, and 2 (2%) other. To participate in this study, participants underwent a diagnostic

evaluation using the ADOS and ADI-R, and the parent or guardian completed the PDDBI. Additionally, the PDDBI and ADOS had to have been completed within one year of each other. Participants had the following DSM-IV diagnoses: 90 (87%) autistic disorder, 6 (6%) Asperger's Syndrome and 8 (8%) pervasive developmental disorder-not otherwise specified (PDD-NOS). Six participants did not complete an Autism Diagnostic Interview-Revised (ADI-R). However, based on record review, ADOS results, record of prior diagnosis, and clinical impression, there was enough supporting evidence for the clinician to provide an ASD diagnosis.

2.2. Autism diagnostic observation schedule-second edition (ADOS-2))

The ADOS-2 is a semi-structured observational measure that evaluates symptoms and behaviors related to ASD (Lord et al., 2012). It is the standard measure for assessing ASD across age, developmental level, and language skills. Advanced training is required for people who plan to administer the ADOS for research (Lord, Rutter, DiLavore, & Risi, 2001). The previous edition, the ADOS, included four modules, which involved various activities and/or questions based on the child's developmental and verbal abilities (Lord et al., 1999). Module 1 is used with children who use little or no phrase speech. Children that use phrase speech but do not speak fluently are administered Module 2. Module 3 is for younger subjects who are verbally fluent and Module 4 is used with adolescents and adults who are verbally fluent (Lord et al., 1999).

Individual items were scored and transferred to an algorithm where scores were totaled in the areas of Communication, Social Interaction, Stereotyped Behaviors and Restricted Interests, and the Total Score comprised of Communication plus Social Interaction. The Total Score was compared to diagnostic cutoffs indicating a classification of 'Autism' or 'Autism Spectrum'. The ADOS-2, the newest version of the assessment, consists of the same modules (1–4) with the addition of the Toddler Module. The ADOS-2 algorithm was revised, with the biggest change being the symptom domain composition and how the items are totaled. This includes a Social Affect and Restricted and Repetitive Behaviors Totals, plus an overall Total Score, which is compared to diagnostic cutoffs indicating a classification of 'Autism', 'Autism Spectrum', or 'Non-spectrum. Additionally, a Comparison Score is provided based on the child's Total Score and age, suggesting a level of symptom severity (Lord et al., 2012).

The ADOS/ADOS-2 was administered by a licensed clinical psychologist with established research reliability. Because some participants completed the ADOS (n = 71) and some the ADOS-2 (n = 33), ADOS algorithms were converted to the ADOS-2 algorithms (Dr. C Lord, personal communication), which show better validity (Gotham, Risi, Pickles, & Lord, 2007), and allowed for a consistency of ADOS-2 data. Information collected from the ADOS-2 included: 1) ADOS-2 Social Affect Total; 2) ADOS-2 Restricted and Repetitive Behaviors Total scores; 3) ADOS-2 Total score; 4) ADOS-2 module; and 5) ADOS-2 Comparison Score.

2.3. Autism diagnostic interview-revised (ADI-R)

The ADI-R is a standardized, comprehensive parent interview that collects information regarding the individual's developmental history as well as history of symptoms in areas associated with ASD (Rutter, Le Couteur, & Lord, 2008). A scoring algorithm is used to determine whether a child meets particular cutoffs for a diagnostic classification of 'Autism' based on scores in the areas of communication, social interaction, and restricted and repetitive behaviors. ADI-Rs were administered by a licensed clinical psychologist with established research reliability and were completed by the primary caregiver.

2.4. Diagnostic and statistical manual of mental disorders-fourth edition-text revised (DSM-IV-TR)

The DSM provides standard criteria for the classification of ASD (American Psychiatric Association, 2013). Using information obtained from the ADOS and ADI-R, and any additional clinical records, a diagnostician provides a 'best estimate' diagnosis based on DSM classifications. Due to timing of the subject enrollment and data collection in this study, DSM-IV (American Psychiatric Association, 2000) classifications were used to ascertain a diagnosis of ASD (autistic disorder, Asperger's Syndrome, or PDD-NOS) rather than the updated DSM-5 (American Psychiatric Association, 2013).

2.5. Pervasive developmental disorder behavior inventory (PDDBI)

The PDDBI is a 188-item caregiver rating scale designed to assess symptoms associated with ASD in children ages 2–12 years (Cohen & Sudhalter, 2005; Cohen, 2003). It was designed to measure both problem behaviors and social communications skills relevant to ASD providing a clinical tool that could assess change over time in follow-up assessments. The PDDBI was standardized on children with ASD. Thus, a T score of 50 (with an SD of 10) is typical of children with ASD of a given age – scores above or below this level represent progressive deviation from the standardization group (Cohen & Sudhalter, 2005). The average child who has ASD will therefore obtain T scores between 40 and 60. Deviations from these could be useful in identifying subgroups across the autism spectrum, assisting in identifying possible comorbidity, and helping to identify specific behavioral targets for interventions (Cohen & Sudhalter, 2005).

The PDDBI provides a general Autism Composite, indicating the level of autism spectrum related symptoms, as well as ten subscale scores and four additional composite scores representing maladaptive and adaptive behaviors. The maladaptive subscales include: Sensory/Perceptual Approach Behaviors; Specific Fears; Arousal Problems; Aggressiveness or Behavior Problems; Social Pragmatic Problems; and Semantic/Pragmatic Problems. Higher domain T scores indicate increasing levels of severity (Cohen & Sudhalter, 2005). The Approach/Withdrawal Problems composite consists of the sum of all of the domains in the Approach/Withdrawal Problems dimension. High scores in this composite are indicative of severe problems in many different domains (Cohen et al.,

2010). The adaptive subscales include: Social Approach Behaviors; Learning, Memory, and Receptive Language; Phonological Skills; and Semantic/Pragmatic Ability. Higher domain scores indicate increasing levels of competence (Cohen & Sudhalter, 2005). The adaptive composites include Expressive Social Communication Abilities and the Receptive/Expressive Social Communication Abilities. The maladaptive composites include Repetitive, Ritualistic, and Pragmatic and the Approach/Withdrawal Problems. The PDDBI was completed for all participants in the study by the primary caregiver (mother). PDDBI data for this study included both adaptive and maladaptive composites, as well as the overall autism composite.

2.6. Analyses

We examined the relationship between the PDDBI Autism Composite and several assessment and demographic variables, including: 1) PDDBI Autism Composite on ADOS-2 Total score and Comparison score; 2) ADOS-2 subscales (Social Affect and Restricted and Repetitive Behaviors); 3) ADOS-2 classification; and 4) participant gender, age, and ethnicity in separate models. In each model, the PDDBI Autism Composite was regressed on the independent variable(s). Categorical variables were dummy coded by creating variables for all but one category of the variable; the group not coded was the reference group. ADOS-2 classification was represented by dummy variables for Autism Spectrum and none; Autism served as the reference group. Participant gender was coded 1 if female and 0 otherwise. Participant age was represented by dummy variables for 48–83 months, 84–119 months, and 120+ months; 24–47 months served as the reference group. Participant ethnicity in separate models was represented by dummy variables for Hispanic, African American, Asian, and Other; White served as the reference group. All regression models were evaluated for outliers using Cook's distance; values greater than one were considered outliers (Cook & Weisberg, 1982). The largest Cook's distance observed across all models was 0.37 and the average maximum Cook's distance from each model was 0.18. Thus, no ameliorative strategies were required due to outlier respondents.

To further assess criterion validity, convergent validity was examined by comparing the PDDBI maladaptive composites with the ADOS-2 Total score, Social Affect, and Restricted and Repetitive Behaviors scores. Divergent validity was assessed by comparing the PDDBI adaptive composites with the ADOS-2 Total, Social Affect, and Restricted and Repetitive Behaviors scores. These analyses were completed using simple regression models.

3. Results

3.1. PDDBI and demographics

The PDDBI Autism Composite score had a mean (S.D.) of 56.5 (12.6) and a range of 24–90. Autism Composite scores were not related to participant age, gender or ethnicity (Table 1). Out of 104 subjects, 63 (61%) were scored on Module 1, 33 (32%) were scored on Module 2, and 8 (7%) were scored on Module 3 of the ADOS-2 indicating that the majority of subjects had little to no speech. PDDBI scores did not vary according to the ADOS-2 module (data not shown).

Table 1
Regression analyses of the relationship between PDDBI Autism Composite score and selected assessment and demographic data. **
 $p < 0.01$.

Variable	PDDBI Autism Composite t (SE)
ADOS Total Score	2.79** (0.25)
ADOS Comparison Score	1.52 (0.82)
ADOS Classification ^a	
Autism Spectrum	−1.22 (3.75)
None	−0.53 (6.44)
Gender	
Female	0.59 (3.52)
Age ^b	
48–82 months	−0.47 (3.32)
84–119 months	1.23 (3.80)
120+ months	−0.46 (6.27)
Ethnicity ^c	
African American	−1.15 (5.91)
Asian	0.13 (6.55)
Hispanic	−0.67 (3.26)
Other	0.91 (3.26)

^a Autism served as the reference group.

^b 24–47 months served as the reference group.

^c Caucasian served as the reference group.

Table 2

Regression analyses of the relationship between PDDBI domains and ADOS-2 scores in 104 children ages 2–11 years of age. * $p < 0.05$, ** $p < 0.01$.

	PDDBI Composites	ADOS-2 Scores	Total Score <i>t</i> (SE)	Social Affect Score <i>t</i> (SE)	Restricted and Repetitive Behaviors Score <i>t</i> (SE)
Convergent Validity	Autism Composite		2.79** (0.04) (<i>r</i> = .27)	2.61* (0.03) (<i>r</i> = .25)	2.46* (0.02) (<i>r</i> = .24)
	AWP		0.72 (0.04) (<i>r</i> = .08)	0.30 (0.03) (<i>r</i> = .03)	2.45* (0.02) (<i>r</i> = .25)
	REPRIT		0.18 (0.04) (<i>r</i> = .02)	-0.13 (0.03) (<i>r</i> = -.01)	1.61 (0.02) (<i>r</i> = .16)
Divergent Validity	REXSACA		-8.38** (0.04) (<i>r</i> = -.65)	-7.97** (0.03) (<i>r</i> = -.64)	-4.41** (0.02) (<i>r</i> = -.42)
	EXSCA		-9.26** (0.03) (<i>r</i> = -.68)	-9.17** (0.03) (<i>r</i> = -.68)	-4.05** (0.02) (<i>r</i> = -.38)

PDDBI Composites include: Autism Composite; AWP, Approach/Withdrawal Problems; REPRIT, Repetitive, Ritualistic, and Pragmatic Problem Behaviors; REXSACA, Receptive/Expressive Social Communication Abilities; EXSCA, Expressive Social Communication Abilities.

3.2. PDDBI and diagnostics

No relationships were shown between the PDDBI Autism Composite and the ADOS Comparison score and ADOS classifications (Table 1).

3.3. Convergent validity

We observed a significant positive relationship between the PDDBI Autism Composite and the ADOS 2 Total Score ($t = 2.79$, $SE = 0.25$, $p = 0.006$), which indicated that PDDBI Autism Composite scores increased in conjunction with the ADOS 2 Total Score (Table 1). Furthermore, the PDDBI Autism Composite was a significant predictor of ADOS-2 Social Affect ($t = 2.61$, $SE = 0.03$, $p = 0.01$) and Restricted and Repetitive Behaviors ($t = 2.46$, $SE = 0.02$, $p = 0.016$) scores. Subscale analyses between the maladaptive PDDBI scales (the Repetitive/Ritualistic/Pragmatic Problem Behavior Composite and the Approach/Withdrawal Problems Composite) showed that Approach/Withdrawal Problems was a significant predictor of ADOS Restricted and Repetitive Behaviors ($t = 2.45$, $SE = 0.02$, $p = 0.016$). However, there was no association between the Repetitive/Ritualistic/Pragmatic Problem Behaviors Composite and the ADOS total, Social Affect, and Restricted and Repetitive Behaviors scores (Table 2).

3.4. Divergent validity

The divergent validity models all exhibited significant negative effects ($p < 0.001$, Table 2), including the adaptive behavior composites of the PDDBI (the Expressive Social Communication Abilities Composite and the Receptive-Expressive Social Communication Abilities Composite) with the ADOS-2 scores (Total, Social Affect, and Restricted and Repetitive Behaviors), which provides evidence supporting divergent validity.

4. Discussion

The objective of this study was to further examine the criterion related validity of the PDDBI as a measure of ASD symptomatology through comparison with the well-established ADOS-2. Correlations were assessed between the PDDBI Autism Composite and maladaptive and adaptive subscale scores, and the ADOS-2 scores. Additionally, we looked at the PDDBI Autism Composite scores across gender, age, ethnicity and diagnostic categories.

Previous studies looking at criterion validity of the PDDBI with other established measures of ASD symptoms have had mixed results (Cohen, 2003; Cohen et al., 2010; McMorris & Perry, 2015). McMorris and colleagues recommended that future validation studies of the PDDBI should include observational diagnostic measures (McMorris & Perry, 2015). Our results extend literature by doing so with the ADOS-2. Convergent validity was supported by a strong correlation between the PDDBI Autism Composite and the ADOS-2 Total, Social Affect, and Restricted and Repetitive Behaviors scales, providing additional evidence that the PDDBI Autism Composite is a solid measure of global autism symptoms. Examination of convergent validity of the PDDBI maladaptive subscales with the ADOS-2 had variable results. The maladaptive subscale, Approach/Withdrawal Problems Composite, showed a strong correlation with the ADOS-2 Restricted and Repetitive Behaviors subscale, further supporting convergent validity. It was not associated with the Social Affect scale, which is likely due to them measuring different constructs (Cohen & Sudhalter, 2005; Cohen, 2003). The lack of association between the Repetitive/Ritualistic/Pragmatic Problem Behaviors Composite and the ADOS total, Social Affect, and Restricted and Repetitive Behaviors scores is concerning as one would expect restricted and repetitive behaviors measured on the PDDBI would be correlated with those measured on the ADOS-2. Divergent validity results were all positive, with the PDDBI adaptive scales showing a strong negative correlation with ADOS-2 scores.

PDDBI scores were not related to age. This was expected based on previous work showing similar results (McMorris & Perry,

2015) and suggests that the scores are independent of age. Additionally, no associations were found between PDDBI scores and ethnicity or gender, although as expected, the study group included a much larger number of males than females (Werling & Geschwind, 2013).

Since there continues to be emphasis on distinguishing ASD according to severity (ADOS-2 Comparison Scores) or level of support needed (DSM-5), the PDDBI Autism Composite and maladaptive scores were compared with the ADOS-2 Comparison Score, a measure of symptom severity. The results did not show a correlation between higher PDDBI Autism Composite scores and ADOS-2 Comparison Scores, as one would expect (Cohen et al., 2010) suggesting that the PDDBI may not be useful for determining level of severity or diagnostic differentiation within the autism spectrum. However, the lack of correlation may be due to differences in how the severity scores are calculated. To address this, the authors of the PDDBI developed a diagnostic decision tree (ASD-DT) to work in tandem with the PDDBI (Cohen, 2017), a tool developed to assist in diagnosis, as well as monitor change over time in children with autism. The ASD-DT for the PDDBI is designed specifically for level 2 screening and was based on a large multisite sample of cases using machine-learning technology (Cohen et al., 2016; Cohen et al., 2017). Results from the ASD-DT generalize well across age-groups and clinical diagnostic sites and agree well with Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000) subgroups (i.e., Autism, Autism Spectrum, and Non-spectrum).

There are a number of limitations to this study. First, the demographic samples in the areas of age, gender, and ethnicity were not equal and many had a small number of participants. For example, fewer females participated than males, although this is expected based on the known gender bias in ASD (Werling & Geschwind, 2013). The sample size is also relatively small and may be underpowered. Although some children were scored on the ADOS versus the newer version, the ADOS-2, an appropriate algorithm conversion provided by the assessment lead developer allowed all subjects to be compared on the ADOS-2 (Dr. C Lord, personal communication). Collecting data equally from different demographic samples will be important for future studies that are interested in these relationships specifically. Future studies looking at these domains should focus on participants that meet DSM-5 criteria for ASD to obtain the most up-to-date, clinically relevant information, and the relationship between the PDDBI, ASD-DT, and DSM-5 criteria examined.

Future studies are needed examining the ability of the PDDBI to reliably measure change in autism symptoms over time. Reliable outcome measures are lacking in the area of autism treatment, and the use of the PDDBI to measure change is important, although not addressed in this study. A review of available outcome measures for ASD concluded that the PDDBI should be considered as part of a recommended battery of tests to measure behavioral outcome in the area of ASD (McConachie et al., 2015). The ease of administration of the PDDBI should also not be overlooked, and it may add valuable data to a research study, especially longitudinal outcome studies.

In summary, convergent validity was supported by a strong correlation between the PDDBI Autism Composite and the ADOS-2 Total, Social Affect, and Restricted and Repetitive Behaviors scales, although not the ADOS-Comparison score. The results of this study provide further support for the validity of the PDDBI as a measure of ASD symptoms for research and clinical purposes.

Conflicts of interest

The authors declare no conflict of interest. The founding sponsors had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript, and in the decision to publish the results.

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