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Investigating the factor structure of the Child Behavior Checklist in a large sample of children with autism spectrum disorder



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ABSTRACT

Background: Autism spectrum disorder (ASD) is characterized by core impairments in social communication and restricted and repetitive behaviors, with high rates of co-occurring emotional and behavioral problems. The Child Behavior Checklist (CBCL) is one of the most widely accepted rating scales used to assess childhood emotional and behavioral problems, and it has been used in many large-scale studies of children with ASD. However, it is not known whether the previously established factor model sufficiently accounts for symptom patterns in children with ASD.

Method: We conducted two Confirmatory Factor Analyses for each of the two versions of the CBCL (ages 1.5–5 and ages 6–18) in a large sample of children with ASD: one on the established measurement model and one on the structural model produced from an Exploratory Factor Analyses. We used several model fit indices to determine the best fitting model.

Results: We found that the established CBCL factor structure was the best fitting model for young children with ASD, but not for older children with ASD.

Conclusions: Models produced from Exploratory Factor Analyses provided evidence that the underlying behavioral constructs measured by the CBCL for ages 6–18 are different in children with ASD than among the typically developing sample. The results of this study have implications regarding how the CBCL should be interpreted in children with ASD.

Autism spectrum disorder (ASD) is characterized by core impairments in social communication and interactions and by restricted and repetitive behaviors (American Psychiatric Association, 2013). In addition, rates of co-occurring emotional and behavioral problems are very high among children with ASD (Simonoff et al., 2008). The prevalence of comorbid psychiatric disorders has been estimated to range widely from 27% to 95% (Joshi et al., 2010; Rosenberg et al., 2011) among children with ASD and 54% to 80% among adults with ASD (Buck et al., 2014; Croen et al., 2015; Ghaziuddin & Zafar, 2008). Among children with ASD, anxiety disorders are the most common co-occurring problem (Caamaño et al., 2013; Gjevik et al., 2011; Salazar et al., 2015); whereas, among adolescents and adults with ASD, major depressive disorder is the most common co-occurring problem (Greenlee, Mosley, Shui, Veenstra-VanderWeele, & Gotham, 2016; Mayes, Calhoun, Murray, & Zahid, 2011). In addition, difficulties with behavior and attention regulation, such as attention-deficit/hyperactivity disorder, behavior problems, and oppositional or defiant behavior frequently co-occur in ASD (Brereton et al., 2006; Eisenhower et al., 2005; Frazier et al., 2001; Gadow et al., 2005; Mayes et al., 2012; Salazar et al., 2015).

Thus, it is important that clinicians and researchers routinely screen for potential emotional and behavioral symptoms across a range of areas. Rating scales and behavioral checklists represent a useful and efficient way of gathering information about a

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child's current symptoms, and are useful for both screening and to inform diagnosis (Lempp, de Lange, Radeloff, & Bachmann, 2012). The Child Behavior Checklist (CBCL) (Achenbach & Rescorla, 2001) is one of the most widely accepted rating scales used to assess childhood emotional and behavioral problems. The CBCL is a parent-report measure that assesses observed functioning across both internalizing and externalizing domains of symptomatology. The CBCL provides scores along both broad-band scales (i.e., Internalizing and Externalizing), and narrow-band syndrome scales, which were empirically derived and developed through factor analysis. The normative group included a very large general population sample of children and adolescents (Achenbach & Rescorla, 2001).

The CBCL has been widely used in an increasing number of research studies of children with ASD. Specifically, it has been used to assess types and correlates of behavioral and emotional problems in children with ASD (Gonzalez & Stern, 2016; Hirata et al., 2016; Ross & Cuskelly, 2006; Samson, Hardan, Lee, Phillips, & Gross, 2015; Son et al., 2015; Xu, Neece, & Parker, 2014; Wade, Cox, Reeve, & Hull, 2014). It has and has also been used as a measure of treatment outcome across a range of interventions. In psychometric research, the CBCL has been involved with verifying the convergent and divergent validity of several measures in ASD, including the Aberrant Behavior Checklist (Kaat, Lecavalier, & Aman, 2014), the Modified Checklist for Autism in Toddlers (Kim et al., 2016), the Social Responsiveness Scale (Cholemkery, Kitzrow, Rohrmann, & Freitag, 2014), the Autism Spectrum Disorders – Comorbidity for Children (Rieske et al., 2013), the Pediatric Anxiety Rating Scale (Storch et al., 2012), the Behavioral Assessment System for Children (Haas, Brown, Brady, & Johnson, 2012), and the Repetitive Behavior Scale-Revised (Mirenda et al., 2010).

The developers of the CBCL have suggested that, in addition to measuring emotional, behavioral, and social problems in children, the CBCL can be used as a screening tool for ASD in clinical settings (Achenbach & Rescorla, 2013; p. 31–39). In practice, several studies have found that the usefulness of the CBCL as a sensitive and specific screener comes more from certain items or subscale scores than from clinically relevant internalizing, externalizing, or total scores. With the CBCL version for younger children (ages 1.5–5), the Withdrawn syndrome scale has been found to have high accuracy in differentiating preschoolers with ASD from preschoolers with other disorders (Muratori et al., 2011; Narzisi et al., 2013; Rescorla, Kim, & Oh, 2015). With the CBCL for older children (ages 6–18), the Withdrawn/Depressed, Social Problems, and Thought Problems syndrome scales have been successful in distinguishing school-age children with ASD from other disorders (Biederman et al., 2010; Ooi, Rescorla, Ang, Woo, & Fung, 2010). At an item-level, one study found ten items were most predictive of ASD: acts young, obsessions, daydreams, prefers to be alone, clumsy, repeats acts, speech problems, stares, behaves strangely, and withdrawn (So, Greaves-Lord, van der Ende, Verhulst, Rescorla, & de Nijs, 2013). Another study found nine items were most predictive: acts young, does not get along with other kids, fears specific animals and situations, prefers to be alone, nervous, repeats acts, speech problems, behaves strangely, and withdrawn (Ooi et al., 2010). Yet another study found just seven items distinguished children with ASD from children with other disorders: avoiding eye contact, not answering when people talk to him/her, not getting along with other kids, lack of guilt after misbehaving, little affection, little interest, and being uncooperative (Rescorla et al., 2015). By contrast, some research has shown lower accuracy of CBCL profiles in identifying children with ASD in the context of children with other clinical problems (Myers et al., 2014; Ooi et al., 2014; Rescorla et al., 2015; So et al., 2013). With the low discriminative accuracy, the use of CBCL profiles for ASD-specific screening may result in a large amount of misclassifications (Havdahl, von Tetzchner, Huerta, Lord, & Bishop, 2016).

The CBCL is also very commonly used when studying comorbid psychopathologies in ASD, as seen in several literature reviews (e.g., Kaat & Lecavalier, 2013; Mannion & Leader, 2013; Matson & Cervantes, 2014; Mazzone, Ruta, & Reale, 2012). Although the CBCL has been widely used to examine co-occurring internalizing and externalizing problems among children with ASD (e.g., Hartley, Sikora, & McCoy, 2008; Mazurek & Kanne, 2010; Vasa et al., 2013), it is not known whether the established factor model that led to the published domain scores adequately accounts for symptom patterns among samples of children with ASD. There are quite a few reasons to suspect a different factor structure for this population. First, ASD involves different types of emotional and behavioral problems than are seen in neurotypical children (e.g., stereotyped or repetitive behaviors and self-injury). Second, emotional and behavioral problems might manifest differently in youth with ASD. For example, the expression of internalizing problems like anxiety and depression may be difficult to interpret, particularly for nonverbal children, and may resemble withdrawn behaviors or lack of social interaction that are also core features of ASD. Third, ASD symptoms may moderate the display of emotional and behavioral problems. For example, restricted interests may mask attention problems or social communication deficits may mask somatic complaints or intensify perceived social problems. By extension, it is not known whether the behavioral constructs thought to underlie the published domain scores are the same in individuals with ASD. If not, then the use and interpretation of the CBCL (and possibly similar questionnaires) may be significantly different with regard to internalizing and externalizing symptom patterns.

Exploratory Factor Analysis (EFA) is useful in initially determining underlying patterns within scales; however, EFA methods are generally assumed to be exploratory and without pre-specified theoretical or empirical expectations. In contrast, confirmatory factor analysis (CFA) can be used to confirm a priori hypotheses regarding the structure of data. In developing new measures, CFA can be particularly useful in establishing construct validity. Specifically, models can be tested to examine the extent to which the underlying structure of the scale is consistent with theoretical expectations regarding number and nature of underlying constructs (Floyd & Widaman, 1995).

The factor structure of the CBCL has been tested and validated in a range of samples (Dedrick, Greenbaum, Friedman, Wetherington, & Knoff, 1997; Greenbaum & Dedrick, 1998). Construct validity of the CBCL syndrome scales has been established using CFA among a wide range of cross-cultural samples (De Groot, Koot, & Verhulst, 1994; Dedrick, Tan, & Marfo, 2008; Ivanova et al., 2010). However, its psychometric properties have yet to be examined among large samples of children with ASD.

To our knowledge, only two studies have specifically examined the factor structure of the CBCL among children with ASD. In the first study, conducted in 2009, Pandolfi and colleagues examined the factor structure of the preschool version of the CBCL among a sample of 128 children with ASD. Given the small sample size, the authors were not able to examine the entire hierarchical model.

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