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Child Behavior Checklist Scores for School-Aged Children with Autism: Preliminary Evidence of Patterns Suggesting the Need for Referral

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Abstract

The *Child Behavior Checklist* (CBCL) is a widely used questionnaire to assess behavioral and emotional problems. It is often used as a diagnostic screener, but autism spectrum disorders (ASD) are not included in the CBCL for school-aged children. This study investigated patterns of CBCL scores in 108 children with high-functioning ASD from two independent samples, and 67 IQ- and age-matched controls. Scores on the CBCL Thought and Social Problems scales significantly differentiated children with ASD from controls. Both independent ASD samples had the same pattern of elevations, with mean scores over two standard deviations above the mean for Social, Thought, and Attention Problems. The Withdrawn/Depressed scale was elevated to at least the borderline clinical range for half of the ASD sample. This pattern of elevations is consistent with two prior studies of the CBCL with school-aged children with ASD, and therefore may warrant follow-up assessment to rule out an ASD.

Keywords

Child behavior checklist; Autism; Asperger's disorder; Diagnostic screening

The Child Behavior Checklist (CBCL; Achenbach & Rescorla 2001), now called the *Achenbach System of Empirically Based Assessment*, is a parent report form to screen for emotional, behavioral, and social problems. The CBCL is “widely used in mental health services, schools, medical settings, child and family services, HMOs, public health agencies, child guidance, and training programs (Achenbach 2009a),” and it has been used in over 6,500 published scholarly articles (Achenbach 2009b). The CBCL's questions are associated with problems on a syndrome scale in eight different categories: anxious/depressed, withdrawn/depressed, somatic complaints, social problems, thought problems, attention problems, rule-breaking behavior, and aggressive behavior. The CBCL also has a scale set to show scores associated with disorders from the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV-TR; American Psychiatric Association 2000): anxiety, oppositional defiant disorder, conduct problems, somatic problems, affective problems, and attention deficit disorder. Many studies have demonstrated a high rate of reliability between the scales of the CBCL and actual psychological diagnosis (Warnick et al. 2007).

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Although the CBCL is designed to screen for the possibility of many psychological disorders, autism and related conditions are not included on the CBCL forms for children over six years old (and over 4 years old in earlier CBCL versions). However, there may be a pattern of elevations on the CBCL that is indicative of an autism spectrum disorder (ASD) rather than evidence of one of the other psychological disorders it was intended to detect. Two studies have explored whether children with ASDs present with a specific pattern of elevations of the CBCL. Bolte et al. (1999) found that children with autism between the ages of 4 and18 years old had mean total problem scores well above non-autism subjects, and their scores for Social, Thought, and Attention problems in particular were approximately three standard deviations above controls. Similarly, Noterdaeme et al. (1999) found that 66% of children with autism had above average scores on the Attention Problems, Social Problems, and Withdrawn scales. One study found that the CBCL could be used to differentiate children with autism from both school-aged children without an identified disorder and children with another psychological disorder (Duarte et al. 2003). Specifically, the Thought Problems scale was found to be best at discriminating the typical school-aged children from the children with autism, with nearly 100% accuracy. The Thought Problems scale could also be used alone to differentiate the children with autism from the children with other psychological disorders, with a sensitivity of 83% and specificity of 71%. Finally, in an investigation of just the Attention Problems scale of the CBCL, Holtmann et al. (2005) found that 65% of adolescents with high-functioning autism or Asperger's disorder had scores at or above the clinical cut-off for Attention Problems, with a median t-score of 74.

Identifying a pattern of CBCL elevations that suggests higher risk for a certain disorder not directly assessed by the CBCL has been successfully applied in other populations. For example, a pattern of t-scores over 70 on the Attention Problems, Aggression, and Anxious/depressed subscales has been found to represent susceptibility to pediatric bipolar disorder in children with attention-deficit/hyperactivity disorder (e.g. Mick et al. 2003). Using this profile has even proved fruitful in the identification of genomic regions of interest in pediatric bipolar disorder (McGough et al. 2008).

Clarifying how the CBCL works in samples of older children with high-functioning autism or Asperger's disorder is particularly important because children with milder ASD symptoms experience a greater delay in the initial identification of their ASD as compared to lower-functioning children (Wiggins et al. 2006). Identifying particular CBCL profiles that are associated with ASD among verbal, school-aged children may help to avoid misdiagnoses and promote earlier referral for evaluations of possible higher-functioning ASD diagnoses. The CBCL is widely used, yet little is known about how it performs in older samples of children with ASD. Therefore, the primary aim of this study was to investigate patterns of elevations on the CBCL in two samples of higher-functioning children with ASD. To further understand the CBCL among children with ASD, we also explored both how the CBCL profiles of participants with ASD were related to measures of ASD symptomotology and we compared CBCL profiles between children with ASD and typically-developing controls.

Methods

Participants

This study included two samples of participants. The use of two samples was intended to provide an opportunity to see if similar patterns exist across two independent groups of children with ASD. Demographic data are provided in Table 1. The majority of children in both samples were Caucasian.

Pittsburgh Sample—The first sample of participants in this study included 78 individuals with high-functioning autism and 67 age- and IQ-matched healthy controls. The participants with autism were community volunteers recruited through advertisements in newsletters, postings on autism-related websites, and presentations for parents and professionals.

All participants had Full Scale and Verbal IQ scores above 70 (i.e. did not have mental retardation) based on the *Wechsler Intelligence Scale for Children-III* (WISC-III; Weschler 1991). All participants spoke in complete sentences. Potential subjects were excluded from the current study if they had associated neurologic, genetic, infectious, or metabolic disorders, such as tuberous sclerosis, fragile-X syndrome, or fetal cytomegalovirus infection. In addition, they had to be cooperative enough to engage in a battery of neuropsychological assessments and brain imaging, which were part of a larger study. Children with severe comorbid diagnoses such as major depression and psychotic disorders were excluded.

All participants with autism met criteria for autism on the *Autism Diagnostic Observation Schedule-Generic* (ADOS-G: Lord et al. 2000) for the Reciprocal Social Interaction, Communication, and Total algorithm scores. In addition, all participants met cutoffs for autism on the *Autism Diagnostic Interview- Revised* (ADI-R; Lord et al. 1994) for Reciprocal Social Interaction, Communication, and Restricted, Repetitive, and Stereotyped Behaviors and had abnormal development before 3 years of age. The diagnosis of autism established on the basis of the ADI-R and ADOS-G was verified by expert opinion based on accepted clinical descriptions of high-functioning autism (Minshew 1996; Minshew and Payton 1988; Rapin 1991; Rutter & Schopler 1987).

Controls were community volunteers recruited through advertisements in neighborhoods with the same socioeconomic level as the families of origin of the participants with autism. They were prescreened by completing a questionnaire on demographic information and family and personal history of medical, neurological, and psychiatric disorders. Inclusion criteria included good physical health, no regular medication use, and good peer relationships based on parent or self-report and staff observations during eligibility testing. Exclusion criteria included a personal history of psychiatric disorders, learning disability or brain insults prior to or after birth, and a family history in first-degree relatives of developmental cognitive disorders, mood, and anxiety disorders, and autism in first-, second-, and third-degree relatives.

Virginia Sample—The second sample of participants included 14 children with high-functioning autism and 16 with Asperger's disorder between the ages of 8 and 15 years old. Participants were recruited through word of mouth and the use of a flyer that was distributed to local autism resource agencies and professionals who work with children with ASDs across Virginia. Participants in the Virginia sample also completed the WISC-III. Although most participants had average or better IQs, two children did fall in the range of mild mental retardation on this measure; both were highly verbal and in mainstream courses, and were therefore considered to be “higher functioning.” All participants were required to have enough fluent speech to be eligible for Module 3 of the ADOS-G. Children with high-functioning autism were diagnosed with the same criteria as the participants in the Pittsburgh group. Participants with Asperger's disorder were diagnosed based on stringent criteria that are consistent with common conceptualization of Asperger's disorder (Klin et al. 2005). They were required to have evidence of social dysfunction, social motivation, verbosity, pragmatic language deficits, normal speech development milestones, circumscribed and interfering interests, the use of pretend play, and the absence of motor stereotypes. Information on these characteristics was gathered from items on the ADOS, ADI, and *Yale Special Interests Survey* (Volkmar and Klin 1996), though the only scale cutoffs that the participant was required to exceed were the social scales of the ADOS-G and

ADI-R. Overall for those with Asperger's disorder, only five scored below the cutoff for communication on the ADI-R, four were below the cutoff for stereotyped behaviors on the ADI-R, four scored below the cutoff for communication on the ADOS-G (and all were at least somewhat elevated on these scales, only barely missing cut-offs).

Measures

The *Child Behavior Checklist/4-18* (Achenbach 1991) was completed by parents to determine the presence or absence of emotional and behavioral problems. The primary difference between the CBCL/4-18 (older version) and the CBCL/6-18 (current version; Achenbach and Rescorla 2001) is updated normative data and a change in the lower limit of the age range. Only six new items were added. The authors noted that: “most children's scores would rank at nearly the same level on the new and 1991 versions;” and, “if a child's functioning has not changed much between assessments on the 1991 and new versions of a form, the child's syndrome scores should be equivalent to about the same percentiles and T scores on each version” (Achenbach and Rescorla 2001, pp 166). Therefore, patterns on the CBCL found in the current study would be expected to be nearly identical to those had the current version of the CBCL been used. This study focused on the syndrome scale scores and t-scores were used in analyses.

A sample of 2,368 children with no mental handicaps was used to create the norms for the CBCL/4-18 (Achenbach 1991). The sample was selected to be diverse with respect to ethnicity, socioeconomic status, region, and residence in rural, urban and suburban areas, as a representation of 48 states. Test-retest reliability was a correlation of .89 for the syndrome scales. Between-parents reliability (inter-parent reliability) ranged from .65 to .75. Cronbach's alpha values ranged from .46 to .93 on the various subscales. Evidence for construct validity is extensive, and included correlations from .59 to .88 with the *Conners Parent Questionnaire* (1973) and with the *Revised Behavior Problem Checklist* (Quay 1983) with clinically-referred children.

Module Three or Four of the ADOS-G (Lord et al. 2000), a structured observational assessment for individuals with fluent speech suspected of ASD, was administered to confirm ASD diagnoses for all participants except the controls. Diagnostic decisions are based on cut-offs for social behavior and communication. The ADOS-G has adequate reliability (kappas.66-.78; alphas.63-.91), and correctly identified 95% of those with autism and 92% of those without a PDD (Lord et al. 2000).

At least one parent of each ASD participant was interviewed with the ADI-R (Lord et al. 1994). The ADI-R has autism cut off scores for communication, social interaction, and restricted, repetitive behavior scales. The ADI-R has adequate reliability (alpha .69 - .95; mean kappa.70), and mean scores for the children with autism significantly differed compared to children who were diagnosed as mentally handicapped or language-impaired (Lord et al. 1994).

Analyses

One-way analyses of variance were done for each syndrome scale of the CBCL to compare t-score means between the three groups: VA autism, PA autism and PA control. The significant levels of difference for the one-way analyses of variance were based on a Bonferonni correction to control for the number of comparisons, which yielded an alpha value of .005. Descriptive data showed the percent of children at or above the borderline clinical range (t score greater than or equal to 67) for each CBCL scale. Correlations between the CBCL scales and the social and communication totals on both the ADOS and

the ADI-R were explored. Finally, logistic regression analyses were performed to look at the ability of CBCL scores to differentiate between the combined ASD group and controls.

Results

Using a one-way analysis of variance, the differences in CBCL syndrome scale t-scores between the VA ASD, PA ASD, and PA control group were investigated. Table 2 shows means and standard deviations on the CBCL scales by group. Both the VA and PA ASD groups had significantly higher scores on all CBCL scales than the control group. Of all the scales, Attention, Social, and Thought Problems scales showed the greatest difference between the ASD groups and the controls with mean differences of approximately 2 standard deviations. Aggressive behavior was the only scale that showed a significant difference between the VA and PA ASD groups, though the difference was less then one standard deviation.

Percentages of children with ASD and controls who scored at or above the clinical range for each CBCL scale can be seen in Table 3. For each scale, no more than 3 of the 67 controls (4.5%) scored at or above the clinical range. Over 50 percent of the children with ASD scored at or above the clinical range for the CBCL total score as well as four of the CBCL scales: Withdrawn/Depressed, Social, Thought, and Attention Problems.

There were few significant correlations between CBCL scores and the ADOS and ADI-R scores. There was a small correlation between the ADOS Social score and the CBCL Anxious/Depressed scale (r = .20, $p = .037$), though this was below the Bonferonni-corrected level of significance. Both the ADI-R Social (r = -.32, $p = .001$) and Communication (r = -.27, p = .005) scores had a negative correlation with the Aggressive Behavior scale on the CBCL. No other correlations were approaching significance.

The overall model of a logistic regression analysis using CBCL scores to predict group membership (combined ASD or control) was significant χ^2 (8, = 175) = 193.02, $p = .000$. Table 4 shows the predicted versus observed diagnostic grouping based on the logistic regression. The analysis correctly identified 96.6% of the sample. The two CBCL scales that were significant predictors were Social Problems, $t(1) = 8.27$, $p = .004$, and Thought Problems $t(1) = 8.30$, $p = .004$.

Discussion

The CBCL is a widely used parent questionnaire that screens for a variety of psychological diagnoses. However, it does not screen for ASDs for children over the age of five. This could lead to misdiagnoses if children with undiagnosed ASD have significant CBCL elevations. Therefore, this study aimed to identify patterns of CBCL syndrome scale elevations for children with ASD that may suggest the need for referral to rule out an ASD. The children with ASD had significantly higher scores than controls for the Total Problems scale, as well as all syndrome scales. The CBCL scores could be used to differentiate the ASD groups from the typically-developing control group with a high degree of sensitivity (.97) and specificity (.96), due primarily to the Social and Thought Problems scales.

Perhaps the most important finding was a nearly identical pattern of CBCL syndrome scale elevations in the two independent ASD samples that participated in this study. The Social, Thought, and Attention Problems scales were the highest, with mean t-scores over 70 (e.g. over two standard deviations above the mean) for both ASD samples. The vast majority of ASD participants had elevated scores on these scales, with 71%, 82%, and 64% respectively scoring at or above a t-score of 67 (“borderline clinical range”). While elevations on the Social scale are not surprising, it is encouraging that it seems to tap the social difficulties in

ASD for most (~3/4) participants given that it was not explicitly designed to assess social concerns of this nature. The Thought Problems scale contains many items that are related to repetitive or unusual behaviors (e.g. twitches, repeats acts, mind wandering, strange behavior, etc). Some of the ASD symptoms (stereotyped speech, "illogical thinking" etc) can be misinterpreted as symptoms of schizophrenia-spectrum disorders (Dossetor 2007), particularly in verbal individuals who have not yet had their ASD identified (e.g. Perlman 2000). Hopefully, awareness that the Thought Problems scale is so frequently elevated in children with ASD could help to avoid a psychotic disorder misdiagnosis, which is critical given the medication implications. The elevated Attention Problems scale is consistent with the vast body of literature highlighting attention problems in ASD (e.g. Goldstein & Schwebach 2004; Grodberg & Kolevzon 2009). How to understand and handle the overlap of attention-deficit/hyperactivity disorder symptoms in children with ASD is a heated debate that is not easily solved (e.g. Frazier et al. 2001; Holtmann et al. 2005); but what is clear from these findings is that practitioners should consider whether there is an ASD diagnosis when the Attention scale is high in combination with the other noted elevations. The final scale that was elevated to at least the borderline clinical range in over 50% of the ASD group was the Withdrawn/Depressed scale. Many of the items on this scale are sensitive to the differences in social reciprocity present in ASD such as being shy, withdrawn, and preferring to be alone.

What makes the parallel CBCL elevations in our two study samples so noteworthy is that these elevations are also highly consistent with the few previous studies of the CBCL among school-aged children with ASD. Bolte et al. (1999) found the exact same pattern, with the highest elevations for the Attention, Social, and Thought Problems scales. Noterdame et al.'s (1999) findings were consistent as well, with the greatest elevations for Attention, Social, and Withdrawn/Depressed scales. Two studies that only reported scores for select CBCL scales also provide further support. Specifically, Holtmann et al. (2005) reported a median score for the Attention Problems scale that was nearly identical to those in this study. Duarte et al. (2003) found the Thought Problems to be highly effective at distinguishing children with ASD.

One possibility that we were unable to explore in this study is that some of the elevations on CBCL scales were due to comorbid disorders rather then having an ASD. This is feasible given that the rates of psychiatric comorbidity are high in ASD (e.g. Leyfer et al. 2006; Mazefsky 2009). It would be helpful for future follow-up studies to include a measure of psychiatric comorbidity, as well as a psychiatric control group, to better understand these relationships. There is, however, reason to believe that the elevations detected in this study are predominately due to the ASD. Namely, the degree of consistency between the two study samples and prior research makes it less likely that idiosyncratic comorbidity patterns were the primary influence on the scores. In addition, the PA sample in particular was part of a larger study involving neuropsychological testing and brain imaging, for which certain comorbid psychiatric disorders were an exclusionary criterion (current depression, psychotic disorders), lending further support to the elevations being due to the ASD.

Fewer correlations then expected were found between the ADOS/ADI scores and the CBCL scales. A restricted range in our ADOS and ADI scores likely hampered our ability to detect a relationship. Given that that the ADOS and ADI were used to determine eligibility and participants with ASD had to have high scores to qualify, there was limited variability in these scores. In addition, ADOS/ADI scores are meant to be used categorically to determine diagnosis rather than as a continuous measure of severity, which might have reduced sensitivity to detect correlations with the CBCL. In future studies of the CBCL in ASD, it would be helpful to include a continuous measure of ASD symptoms such as the *Social*

Responsiveness Scale (Constantino and Gruber 2005), administered to both the children with ASD and controls.

This paper is just the first step in understanding how the *CBCL* may aid in ASD diagnoses. It adds to the few reports in the literature of how the *CBCL* performs when administered to children with ASD. However, in clinical practice, the question is often not whether or not a child is typically-developing versus ASD. Rather, the differential diagnosis is usually between other disorders such as language delay, attention-deficit/hyperactivity disorder, behavioral disorders, or anxiety, etc. A limitation of this study is that only a typically-developing control sample was available. Therefore, we were not able to determine how well the CBCL performs at differentiating children with ASD from these other disorders, and whether or not some of these other disorders may also have a similar pattern of elevations. Thus the results should be considered preliminary, barring future follow-up with other types of control groups.

Despite some of these limitations, the findings of this study do point to a pattern of elevations consistent with previous research that may be interpreted as a possible red flag for ASDs. This pattern of elevations should not be taken alone as enough support for an ASD diagnoses because it still needs to be determined if this pattern is unique to ASD populations. However, it will be important for clinicians to utilize this information to refer for more in-depth ASD evaluations or to inquire more in this area themselves. It might be helpful for future editions of the CBCL to move toward including an ASD scale, as is already the case in the CBCL version for 1.5 to 5 year olds (Achenbach and Rescorla 2000). Until then, future research that includes questionnaires of autism severity, exploration of how CBCL items relate to ASD diagnoses, measures of psychiatric comorbidity, and additional types of comparison groups (developmental disorders and psychiatric disorders) would help sharpen the utility of the CBCL for identifying older children with possible missed ASD diagnoses. As is true with any screening questionnaire, it is critical to base final diagnostic decisions on multiple sources of information, including observation, clinician judgment, and parent interview.

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Table 1

Demographic and Descriptive Data

	Virginia Data N = 30		PA Autism Data N = 78		PA Control Data N = 67	
	Mean (SD)	**Range**	**Mean (SD)**	**Range**	**Mean (SD)**	**Range**
Age in Years	11.20 (2.33)	8-15	12.49 (3.19)	8-18.58	13.05 (2.73)	8.33-18.83
Overall Adaptive Behavior[a]	77.36 (23.31)	35-132	72.84 (14.81)	46-107	100.09 (12.46)	71-119
Verbal IQ	101.90 (25.28)	54-142	102.07 (14.22)	80-141	110.12 (9.06)	93-131
Performance IQ	96.14 (18.91)	66-137	99.91 (15.58)	69-141	108.15 (10.60)	86-132
Full Scale IQ	99.14 (22.04)	56-142	101.06 (14.52)	77-137	109.90 (9.93)	90-133
Percent Male	86.7%		85.5%		77.6%	

Note.

[a]Adaptive Behavior Scores are based on the Broad Independence scale of the *Scales of Independent Behavior* for the Virginia sample and the Adaptive Behavior Composite of the *Vineland Adaptive Behavior Scales* for the Pennsylvania sample.

Table 2

Means, Standard Deviations, and Medians for CBCL Scales by Sample

	VA Autism N = 30			PA Autism Data N = 78			PA Control Data N = 67				
CBCL Scale	**Mean (SD)**	**Median**	**Range**	**Mean (SD)**	**Median**	**Range**	**Mean (SD)**	**Median**	**Range**	***F***	***p*-value**
Total Score	69.5[a] (8.11)	71.00	46-82	66.85[a] (7.36)	67.50	47-81	42.33[b] (10.20)	42.00	23-67	176.37	.000
Anxious/Depressed	68.37[a] (9.61)	68.50	50-83	65.03[a] (9.57)	64.50	50-88	51.42[b] (2.97)	50.00	50-63	74.87	.000
Withdrawn/Depressed	67.90[a] (10.33)	68.00	50-89	66.90[a] (9.58)	67.50	50-94	51.40[b] (4.43)	50.00	50-76	77.41	.000
Somatic Complaints	58.57[a] (9.16)	57.00	50-80	58.12[a] (8.81)	56.00	50-84	52.57[b] (5.45)	57.00	50-79	12.81	.000
Social Problems	71.97[a] (9.69)	70.00	50-98	71.72[a] (9.89)	70.00	50-91	51.13[b] (3.53)	50.00	50-70	136.97	.000
Thought Problems	73.10[a] (8.82)	74.00	51-97	71.33[a] (7.54)	70.00	50-91	51.73[b] (4.33)	50.00	50-67	183.27	.000
Attention Problems	71.03[a] (12.76)	70.00	52-100	72.44[a] (9.08)	73.00	50-95	52.12[b] (4.93)	50.00	50-81	111.65	.000
Rule-Breaking Behavior	59.00[a] (5.57)	60.00	50-68	55.74[a] (5.98)	54.00	50-76	52.12[b] (3.78)	50.00	50-68	20.17	.000
Aggressive Behavior	65.13[a] (11.70)	64.00	50-100	58.03[b] (7.43)	57.00	50-79	51.48[c] (3.69)	50.00	50-70	38.67	.000

Superscripts that differ from each other are significantly different at $p < .005$

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Table 3

Percent of Children at or Above the Borderline Clinical Range for the CBCL Scales (t ≥ 67)

CBCL Scale	ASD Samples %	Control Sample %
Total Score	63.1	1.5
Anxious/Depressed	48.3	0.0
Withdrawn/Depressed	55.5	3.0
Somatic Complaints	19.5	4.5
Social Problems	71.2	1.5
Thought Problems	82.4	4.5
Attention Problems	64.1	1.5
Rule-Breaking Behavior	10.2	0.0
Aggressive Behavior	22.0	1.5

Table 4

Classification Table (Logistic Regression)

		Predicted		
		Autism	**Control**	**Percentage Correct**
Observed	Autism	105	3	97.2
	Control	3	64	95.5
	Overall Percentage			96.6