Published in final edited form as:

J Child Fam Stud. 2016 January ; 25(1): 65–76. doi:10.1007/s10826-015-0203-x.

Assessing Attention and Disruptive Behavior Symptoms in Preschool-Age Children: The Utility of the Diagnostic Interview Schedule for Children

Benjamin Rolon-Arroyo¹, David H. Arnold¹, Elizabeth A. Harvey¹, and Nastassja Marshall¹

¹Department of Psychology, University of Massachusetts-Amherst, 441 Tobin Hall, Amherst, MA 01003, USA

Abstract

Data are presented from two samples of preschool children to evaluate the reliability, concurrent validity, and predictive validity of the ADHD, ODD, and CD sections of the Diagnostic Interview Schedule for Children, Fourth Edition (DISC-IV). Information was obtained from a community sample of 128 children ($M_{\text{age}} = 53.16$ months; 63 girls) and from a sample of 72 externalizing children ($M_{\text{age}} = 45.23$ months; 31 girls) plus 25 control children ($M_{\text{age}} = 44.51$ months; 8 girls). In both studies, the DISC-IV was administered to parents along with parent and teacher behavior rating scales, and teacher rating scales were obtained again later to evaluate the predictive validity of the DISC-IV (after approximately 6 months in Study 1, and 3 years in Study 2). The ADHD and ODD sections exhibited acceptable internal consistency in both studies, and showed concurrent validity with parent behavior rating scales. In both studies, the ADHD section was also concurrent with teacher reports. In Study 2, the ADHD, ODD, and CD sections distinguished externalizing children from controls. In both studies, the ADHD section predicted future teacher ratings beyond initial teacher ratings, and beyond initial parent rating scales; the ODD section similarly predicted later teacher ratings in Study 1. Findings provide strong support for the utility of the ADHD section for preschool children and moderate support for the ODD and CD sections.

Keywords

Evidence-based assessment; DISC-IV; ADHD; ODD; CD; Preschool; Early identification

Introduction

Symptoms of attention deficit-hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD) often begin in the preschool years, and earlier onset is associated with worse outcomes (Keenan and Wakschlag 2004; Loeber et al. 2000; Mesman and Koot 2001). Early problems in each of these areas, particularly when severe, typically indicate chronic, lasting difficulties (Harvey et al. 2009; Keenan et al. 2011; Lahey et al. 2004; Riddle et al. 2013; Rolon-Arroyo et al. 2014). However, not all preschool children with symptoms develop these disorders, particularly among younger preschoolers (Campbell

et al. 1986; Harvey et al. 2009; Lavigne et al. 1998, 2001). Thus, it is important to establish evidence-based measures of attention and disruptive behavior symptoms for early childhood that are reliable, and in particular that exhibit predictive validity. Accurate early identification of children who will continue to exhibit attention and disruptive behavior symptoms is critical given their associated negative outcomes (e.g., Lee et al. 2008; Moffitt 1990) and the availability of effective interventions for preschoolers (Barkley et al. 2000; McGoey et al. 2002; Reynolds and Kelley 1997; Webster-Stratton et al. 2001).

Despite the recent publication of the fifth edition of DSM (DSM-5; American Psychiatric Association 2013), the Diagnostic Interview Schedule for Children, Fourth Edition (DISC-IV), created to map directly onto diagnostic criteria set by the DSM-fourth edition (DSM-IV; American Psychiatric Association 2000), remains relevant due to the minimal changes for ADHD, ODD, and CD. ADHD has been moved to a new chapter that covers neuro developmental disorders; however, the symptoms of ADHD remain unchanged. Similarly, ODD and CD have been moved to a chapter covering Disruptive, Impulse-Control and CDs, but again the symptoms of ODD and CD remain unchanged.

There are a number of reasons that the DISC-IV ought to be evaluated for its utility with preschool children. First, the DISC-IV provides information that is directly relevant to diagnoses (Krol et al. 2006). This interview compares favorably to other measures in terms of its ability to avoid false negatives (Angold et al. 2012) and shows convergence with clinician diagnoses (Schwab-Stone et al. 1996) and inpatient observations (Friman et al. 2000). A recent push for evidence-based diagnosis recommends the use of measures such as the DISC-IV to increase diagnostic accuracy (Jensen-Doss 2005). Second, the DISC-IV compares favorably to other measures (Cohen et al. 1987; Jensen et al. 1993; Kasius et al. 1997). Behavior rating scales such as the Eyberg Child Behavior Inventory (ECBI; Eyberg and Pincus 1999), the Behavior Assessment System for Children (BASC; Reynolds and Kamphaus 1992), and Teacher's Report Form (TRF; Achenbach 1991) are available for parents and teachers and have been shown to be useful in assessing externalizing problems. However, behavior rating scales do not provide information about diagnostic symptoms, and are therefore only indirectly relevant to diagnoses. Further, they provide limited opportunities for an assessor to query the informant and gain more detailed information about the reported behaviors, such as onset, severity, or level of impairment. Overall, these measures have been found to provide important, yet limited information about attention and disruptive behavior symptoms. Third, the DISC-IV's disruptive behavior module is one of the most commonly used and highly recommended structured interviews for attention and disruptive behavior disorders for school-age children in both research and clinical settings (Anderson and Ollendick 2012; Frick and McMahon 2008; McGrath et al. 2004). Other strengths of the DISC-IV include the fact that trained technicians can administer the interview and a computerized form is available. The DISC-IV is time efficient since modules, such as the disruptive behavior module, can be administered individually (Shaffer et al. 2000). In addition, acceptable psychometric properties have been established. The creators of the interview have reported that the parent version of the DISC-IV exhibits test-retest reliability of .79 for ADHD, .54 for ODD, and .43 for CD (Fisher et al. 1997). Overall, the DISC-IV's disruptive behavior module is promising for identifying children in need of services.

Only a few studies have reported any psychometric or utility information on the DISC-IV for preschool children; despite promising initial findings, there is a need to further examine the utility of this measure. In one sample of preschool boys diagnosed with ODD, an earlier version of the DISC did not predict future diagnosis and was not able to discriminate stable from transient ODD cases (Speltz et al. 1999), though initial ADHD symptoms did predict ADHD diagnosis at follow-up. The authors noted the limitation of using a diagnostic interview without established reliability and validity for preschool children. Lahey et al. (2004) utilized the DISC-IV to establish the predictive validity of the ADHD section over a 3-year period. However, the mean age of the overall sample was over 5 years of age, limiting the extrapolation of results to younger children. Riddle et al. (2013) reported on the follow-up of the Pre-school Attention-Deficit/Hyperactivity Disorder Treatment Study (PATs), in which the DISC-IV was utilized as an initial screen for participants. Despite a decrease in symptoms reported by parents and teachers 3 years later, 89 % of children maintained an ADHD diagnosis. Doctoroff and Arnold (2004) found that a DISC-IV externalizing composite score predicted year-end parent reports above and beyond initial parent rating scale scores, demonstrating that obtaining more extensive information from the same informant can be useful. More recently, in a longitudinal study of children exhibiting attention and disruptive behavior symptoms (Harvey et al. 2009), ADHD diagnosis obtained using the DISC-IV at age 3 exhibited overall predictive power (OPP) of .69 in predicting later ADHD diagnoses, while ODD diagnosis yielded .67 OPP for predicting later ODD diagnoses. With regard to the CD section, Rolon-Arroyo et al. (2014) found that CD symptoms in 3-year-old children as reported by parents predicted CD symptoms 3 years later, above and beyond ADHD and ODD symptoms. Overall, initial findings are promising, but more reliability and validity information is needed about this diagnostic interview for preschool children.

The main outcomes in most of the above studies on the DISC-IV with preschool children were parents' reports (Doctoroff and Arnold 2004; Harvey et al. 2009; Rolon-Arroyo et al. 2014; Speltz et al. 1999), thus there is a need to examine how the DISC-IV relates to independent assessments. Teacher report is our primary outcome partly to avoid method variance, and partly because teacher reports have demonstrated strong validity (Fagot and Leve 1998; Hayden et al. 2005; Kerr et al. 2007). Multi-informant input is important in assessing attention and disruptive disorders (American Psychiatric Association 2013). Parents and teachers are usually the most familiar with children and are likely to be the first to become concerned about attention and disruptive behavior symptoms. Previous research has found that the agreement between parents and teachers is generally modest when evaluating children's behavior (Achenbach et al. 1987; Graves et al. 2012). Nonetheless, assessing the extent to which parents' reports on the DISC-IV relates to teachers' reports concurrently and across time can provide information on its utility.

The present study examined the utility of the attention and disruptive behavior sections of the DISC-IV for preschool children in two samples: a community sample and an externalizing sample. Specifically, we evaluated the reliability, concurrent validity, and predictive validity of the DISC-IV in each sample. Reliability was expected to be at least acceptable for each DISC-IV section. In terms of concurrent validity, it was predicted that DISC-IV sections would be modestly correlated with corresponding teacher ratings in both

the community and externalizing sample (Korsch and Petermann 2013; Strickland et al. 2012). In the externalizing sample, we also expected that the DISC-IV would distinguish externalizing children from controls. In both studies, we were particularly interested in whether the DISC-IV predicts future teacher reports given the critical need for better predictors of future behavior problems. While we previously found that DISC-IV scores predicted later parent ratings (Doctoroff and Arnold 2004), examining predictive utility across informants provides a much stronger validity test. We expected the ADHD section to predict future teacher ratings more strongly than ODD and CD because teachers may be more attuned to the presence of ADHD symptoms (Strickland et al. 2012).

Study 1

Method

Participants—The primary caregivers and teachers of 128 preschool children ($M_{\text{age}} = 53.16$ months, $SD = 6.48$; 63 girls) participated as part of a larger project Arnold et al. (2008). Families were recruited from seven urban child-care centers, with a total of 20 classrooms. Most of the classrooms were led by two teachers, and the children in these classrooms received ratings from both teachers. Five of the seven centers served low-socioeconomic status (SES) families from ethnically diverse backgrounds ($n = 93$), and two predominantly served higher-SES European American families ($n = 35$). Thirty-seven parents identified their children as African American, 41 children as European American, 38 as Latino American, and 12 as mixed ethnicity.

Participating parents from centers serving predominantly low-SES families reported a median family income of \$28,042 ($SD = \$17,508$). In contrast, families from the two higher-SES centers reported a median income of \$85,904 ($SD = \$79,725$). With respect to highest completed education level by parents, 1 % of the sample completed elementary school, 6 % completed junior high school, 48.5 % completed high school, and 44.5 % completed college. Fourteen parents did not report level of education attained, thirteen of whom were from the low-SES group.

From the initial assessment to the follow-up there was 28.78 % attrition in teachers' ratings, or 33 reports. Nineteen of the missing teacher reports belonged to the low SES group and 14 missing reports belonged to the high SES group. There were two teachers who did not complete post ratings, accounting for 17 of the missing reports. Almost all of the other missing reports were due to children leaving the classrooms. Pretest ADHD Inattentive symptoms were higher in the missing cases ($M = 1.58$, $SD = 1.52$) than in those who remained in the study ($M = .81$, $SD = 1.23$), $t(126) = 2.89$, $p = .005$, but participants did not differ on any other demographic or pretest variables. At Time 2 there were 49 boys and 45 girls remaining.

Procedure—Letters were sent to all families of 4-year-olds from each preschool inviting them to take part in a study of child development. Approximately 2 months into the school year (Time 1), interested parents attended a meeting during which they completed consent forms, questionnaires, a behavior rating scale, and the DISC-IV. Doctoral students in clinical psychology administered the parent version of the DISC-IV. Their DISC-IV training was

conducted by a licensed clinical psychologist with extensive experience conducting such structured interviews, and included didactic instruction, extensive practice sessions, evaluative role-playing with the trainer, and interview observations. Teachers completed a behavior rating scale for each participating child in their class. Teachers completed the questionnaires again approximately 6 months later, in mid-spring (Time 2). When two teachers worked with each child, the average teacher score was used because aggregated data are more reliable/accurate than single measures. Approximately half of the children received an intervention designed to reduce behavior problems. Although this program was not effective, we controlled for intervention status in all analyses.

Measures

DISC-IV Parent Report: At Time 1, parents were administered the ADHD and ODD sections of the DISC-IV (Fisher et al. 1994), with minor modifications to school-related questions to be appropriate for preschool children. For example, for the question about having trouble finishing things in the ADHD section, instead of asking “did he often have trouble finishing his homework or other things he was supposed to do,” we asked “did he often have trouble finishing things he was supposed to do.” The interview included home and school questions assessing the nine ADHD Hyperactivity/Impulsivity (ADHD HI) symptoms and the nine ADHD Inattentive (ADHD IN) symptoms. The interview also assessed the eight ODD symptoms. These symptom questions were the focus of the analyses for the present study. Conduct disorder symptoms were not used in this study because of their extremely low occurrence. A symptom was counted as present if parents endorsed it as problematic either at home or at school or both, with respect to the previous 6 months. Scores represent a simple count of the number of symptoms present, with each symptom counting once even if present in both locations.

The Caregiver—Teacher Report Form (C-TRF): The C-TRF, a 113-item behavior rating scale completed by teachers at Time 1 and 2, was used to measure children’s attention problems, aggressive, and delinquent behaviors (Achenbach 1991). This measure includes ratings of the frequency of inattention, hyperactivity, aggressive behavior (e.g., arguing, defiance, disruptive behavior, and teasing), and unacceptable behavior (e.g., stealing, lying, swearing). This scale is among the most comprehensive measures of child psychopathology, using a strong empirically-based classification system. It has been evaluated in at least 14 societies (e.g., Ivanova et al. 2011), and used in hundreds of studies. It has been used extensively with preschool children with acceptable to excellent reliability (internal consistency = .72–.95), with the scale distinguishing children in need of referral from those who do not (Achenbach 1991). The sections of the C-TRF that were expected to be related to ADHD and ODD symptoms were used in the present study. Specifically, the Attention Problems section assesses symptoms of both ADHD HI and IN and the Externalizing Behavior Broadband scale assesses behaviors associated with ODD.

Eyberg Child Behavior Inventory (ECBI): Parents completed the ECBI, a 36-item self-report inventory of attention and disruptive behaviors (Eyberg and Pincus 1999). This measure has strong reliability and validity for detecting behavior problems in young children. The Eyberg Intensity factor, a measure of the severity of behavior problems (e.g.,

aggression, defiance, lying, overactivity, and inattention), was utilized to measure behavior problems. Psychometric analyses of the ECBI within our sample indicated that the measure has high internal consistency (Cronbach's $\alpha = .93$).

Analyses—The reliability of each DISC-IV section, in terms of internal consistency, was measured with the KR-20 formula. ADHD Combined scores (i.e., ADHD HI plus ADHD IN) were used to assess both concurrent and predictive validity because the ECBI and C-TRF Attention Problems do not separate hyperactivity and inattentiveness. Concurrent validity was examined in terms of the correlations between Time 1 sections from the DISC-IV with the ECBI and corresponding C-TRF sections. Predictive validity was evaluated in two ways. First, to evaluate the extent that DISC-IV symptoms predicted later teacher ratings beyond initial teacher ratings, we regressed each Time 2 C-TRF score on its corresponding Time 1 DISC-IV section, while controlling for Time 1 C-TRF scores and intervention status. We also controlled for initial age and gender given their well-established relations with externalizing behavior (e.g., Waschbusch 2002, Elder 2010). Second, to evaluate the extent to which DISC-IV symptoms predicted later teacher ratings beyond initial parent rating scale scores, we regressed each Time 2 C-TRF scores on its corresponding Time 1 DISC-IV sections, while controlling for Time 1 ECBI scores, initial age, sex, and intervention status.

Results

Table 1 presents the means and standard deviations of the main study variables by sex, and Table 2 presents intercorrelations among the main study variables. At Time 1, the prevalence of symptoms was consistent with the community nature of the sample, and similar to past studies (Lavigne et al. 2009). Eight children (6 % of the sample) met the four-symptom threshold for ODD (7 boys). Eighteen children (14 % of the sample) met the six-symptom diagnosis threshold for ADHD HI (13 boys) and one child met the six-symptom threshold for ADHD IN (a boy, who also exhibited 3 ADHD HI symptoms). It is somewhat surprising that more children did not reach criteria for inattention problems, though low rates of ADHD IN symptoms have been found in other samples of young children (Applegate et al. 1997; Harvey et al. 2014; Willoughby et al. 2012). Also, the 18 children who met the threshold for ADHD HI did show an average of 2.06 IN symptoms ($SD = 1.26$), which is twice as many as the sample as a whole. As expected, boys exhibited more ADHD HI and ODD symptoms than girls.

Teacher reports of attention and disruptive behaviors were found to be very slightly higher than the national average (Achenbach 1991). Attention problems and externalizing behavior broadband scores were fairly stable across the school year, and were correlated with one another at both Time 1 and Time 2 (see Table 2).

Reliability—The internal consistency of the ADHD HI ($KR-20 = .72$) and ODD ($KR-20 = .75$) sections were found to be acceptable for the sample as a whole (see George and Mallery 2003, for reliability benchmarks). Reliability for the ADHD IN section ($KR-20 = .62$) was found to be modest, while the internal consistency of ADHD combined symptoms (i.e., HI plus IN) was acceptable ($KR-20 = .77$). The internal consistencies of the DISC-IV sections

were also computed by sex, and stronger reliability was found for boys than girls for all three sections (see Table 3).

Concurrent Validity—We assessed the degree to which the ADHD and ODD sections correlated with the ECBI and their respective C-TRF sections at Time 1 (see Table 2). As expected, the ADHD and ODD sections were associated with parent-rated ECBI scores. Also as expected, the ADHD section was associated with attention problem scores on the C-TRF. On the other hand, the ODD section did not show concurrent validity with the C-TRF Externalizing Behavior Broadband. It is of interest to note that the ADHD section was significantly related to the C-TRF Externalizing Behavior Broadband.

Predictive Validity—In terms of the predictive validity, the Time 1 ADHD symptoms predicted Time 2 C-TRF attention problem scores, above and beyond initial teacher ratings, initial age, sex, and intervention status, $b = .35$, $SE = .11$, $p = .003$; $R^2 = .64$; R^2 change = .04. Similarly, the Time 1 ODD symptoms predicted Time 2 C-TRF Externalizing Behavior Broadband scores, above and beyond initial teacher ratings, initial age, sex, and intervention status, $b = 1.14$, $SE = .40$, $p = .006$; $R^2 = .67$; R^2 change = .03.

We also assessed the utility of the ADHD and ODD sections in predicting future teacher report above and beyond the initial parent rating scale (ECBI). Time 1 ADHD symptoms predicted Time 2 C-TRF attention problem scores, above and beyond initial parent ratings, initial age, sex, and intervention status, $b = .58$, $SE = .19$, $p = .003$; $R^2 = .15$; R^2 change = .10. Time 1 ODD symptoms did not predict Time 2 C-TRF Externalizing Behavior Broadband scores, $b = .59$, $SE = .75$, $p = .44$, once initial ECBI scores were controlled.

Study 2

Method

Participants—Participants were 97 children from a larger study of the early development of ADHD and ODD Harvey et al. (2007). Children included in the present study were 3 years old at screening, and averaged 45.05 months ($SD = 2.99$) at the first home visit (Time 1) and 81.46 months ($SD = 4.77$) at the follow-up visit 3 years later (Time 2). Seventy-two of these children ($M_{Age} = 45.23$ months, $SD = 2.97$; 31 girls) were identified as exhibiting significant externalizing problems, and 25 children ($M_{Age} = 44.51$, $SD = 3.05$; 8 girls) were recruited as a control sample. These children and their 97 female primary caregivers (biological mothers = 93; adoptive mothers = 4) and 54 male caregivers participated in a 3-year longitudinal study. The sample included European American (75.3 %), Latino (6.2 %; mostly Puerto Rican), African American (10.3 %), and multiethnic (8.2 %) children. Most mothers (97 %) and fathers (99 %) had at least a high school education and 47 % of mothers and 37 % of fathers had bachelor's degrees.

The participants in the present study were part of a larger study that included 199 children in an externalizing group and 59 in a typically developing comparison group. However, because we were interested in whether DISC-IV scores predicted future problems *above and beyond initial teacher report*, the 99 children from the externalizing group and the 28 children from the comparison group with initial teacher report were our population of

interest (because of their age, a substantial number of the 3-year-old children were not in preschool, and thus did not have teacher reports). Of these children, 72 from the externalizing group (73 %) and 25 from the comparison group (96 %) had teacher reports at follow-up 3 years later and were included in this study. Mothers' age was the only demographic difference between the included externalizing children and those without teacher reports at follow-up (those that weren't included had younger mothers). In terms of symptoms, the children who weren't included exhibited more DISC-IV ADHD IN symptoms ($M = 4.78$, $SD = 2.75$) than those with Time 2 teacher reports ($M = 3.67$, $SD = 2.25$), $p = .04$.

Procedure—Participants were recruited by distributing questionnaire packets through state birth records, pediatrician offices, childcare centers, and community centers. The children exhibiting significant attention and disruptive behaviors ($n = 199$) were recruited from 1752 3-year-old children whose parents completed a screening packet containing the BASC-Parent Rating Scale (PRS; Reynolds and Kamphaus 1992) and a questionnaire assessing for exclusion criteria (i.e., no evidence of mental retardation, deafness, blindness, language delay, cerebral palsy, epilepsy, autism, or psychosis), parental concern about attention and disruptive behaviors, and demographic information. Criteria for the externalizing sample were: (a) parent responded “yes” or “possibly” to the question, “Are you concerned about your child’s activity level, defiance, aggression, or impulse control?” and (b) BASC-PRS hyperactivity and/or aggression subscale T scores at or above 65.

Children ($n = 59$) without significant behavior problems were also recruited as controls. For the control children, criteria were: (a) parent responded “no” to the question, “Are you concerned about your child’s activity level, defiance, aggression, or impulse control?” and (b) T scores on the BASC-PRS hyperactivity, aggression, attention problems, anxiety, and depression subscales at or below a T score of 60. Bilingual staff conducted home visits for Spanish-speaking families, and all child behavior measures were available in Spanish.

At Time 1, eligible families were scheduled for two 3-h home visits approximately 1 week apart, and each parent was paid a total of \$200. Teachers completed the BASC-Teacher Rating Scale (TRS) at Time 1 and again approximately 3 years later. The only missing data was one BASC-TRS aggression score in the externalizing group, due to items omitted by the teacher.

Measures

DISC-IV Parent Report: During the first home visit, the DISC-IV (Fisher et al. 1994) was administered. The symptom questions were the focus of the analyses for the present study. Minor modifications to school-related questions were made to be appropriate for preschool children. Seven of the CD symptoms that were judged to be age inappropriate were omitted: use of weapon, stealing while confronting a victim, sexual assault, breaking into private property, staying out at night, running away from home, and truancy. Interviews were administered to mothers or jointly to both parents when available. Fathers participated in the interviews for 58 % of the externalizing group and 48 % of the control group. Mothers' responses were used in the very rare cases of open disagreement between mother and father,

because they were the primary caregivers. This ensured a standardized procedure that would use information from the parent who spent the most time with the child.

BASC-Parent Rating Scale (PRS) and BASC-Teacher Rating Scale (TRS): The BASC-PRS (Reynolds and Kamphaus 1992) was completed at Time 1 by mothers, and the BASC-TRS was completed at Time 1 and Time 2 by teachers. This comprehensive rating scale assesses a broad range of psychopathology. T-scores (based on general, not gender-specific, norms) for the hyperactivity and aggression subscales were used. These two subscales have demonstrated good reliability for 2- to 3-year-old children ($\alpha = .79$ and $.83$ for the PRS, and $\alpha = .92$ and $.88$ for the TRS; Reynolds and Kamphaus 1992). The BASC has distinguished school-aged children with and without ADHD (Ostrander et al. 1998).

Analyses—The reliability of each DISC-IV section, in terms of internal consistency, was assessed with the KR-20 formula. Concurrent validity was evaluated in two ways. First, *t* tests were computed to compare the externalizing group and the control group on their number of ADHD HI, ADHD IN, ODD, and CD symptoms. Concurrent validity was examined in terms of the correlations between Time 1 DISC-IV sections and parent ratings on the BASC-PRS and teacher ratings on the BASC-TRS. Predictive validity was evaluated in two ways. First, to evaluate the extent that DISC-IV symptoms predicted later teacher ratings beyond initial teacher ratings, we regressed each Time 2 BASC-TRS section score on its corresponding Time 1 DISC-IV section, while controlling for Time 1 BASC-TRS scores and age. We did not control for sex in these analyses because we found no initial differences between boys and girls on DISC-IV or BASC scores. Second, to evaluate the extent to which DISC-IV symptoms predicted later teacher ratings beyond initial parent rating scale scores, we regressed each Time 2 BASC-TRS score on its corresponding Time 1 DISC-IV section, while controlling for Time 1 BASC-PRS scores and initial age.

Results

Table 4 presents Time 1 DISC-IV, BASC-PRS and BASC-TRS score means and standard deviations for each group by sex. No significant differences were found between boys and girls on any of these measures. At Time 1, the prevalence of symptoms was consistent with an externalizing group. Fifteen children met the symptom criteria for ADHD combined type (21 % of the sample), 37 children (46 % of the sample) met the six-symptom criteria for ADHD HI, and 17 children (24 % of the sample) met the six-symptom criteria for ADHD IN. Forty-nine children (68 % of the sample) met the four-symptom criteria for ODD and 13 children (18 % of the sample) met the three-symptom criteria for CD.

Reliability—Internal consistency was examined in the externalizing group because the focus of this study is to assess reliability in children exhibiting significant behavior problems. The internal consistency of the ADHD IN section was acceptable ($KR-20 = .71$) and the internal consistency of the ADHD HI section was modest ($KR-20 = .64$); however, the internal consistency of both sections together, as they are often reported, was found to be good ($KR-20 = .81$; see George and Mallery 2003, for reliability benchmarks). The internal consistency of the ODD section was acceptable ($KR-20 = .73$) and the internal consistency of the CD section was poor ($KR-20 = .36$). The internal consistencies of the DISC-IV

sections were also computed by sex (see Table 3). Stronger reliability was found for boys than for girls on most of the sections.

Concurrent Validity—Children in the externalizing group were reported to have significantly higher ADHD HI, ADHD IN, ODD, and CD symptoms than the control group (See Table 4). Effect sizes were large for all comparisons. Moreover, even within the externalizing group, substantial variability was seen in all sections, allowing for the possibility that the DISC-IV could provide predictive utility even within the externalizing group.

Table 5 presents correlations among the Time 1 measures. ADHD HI symptoms were correlated with BASC-PRS hyperactivity scores ($r = .63, p < .001$), but were not significantly correlated with BASC-TRS hyperactivity scores ($r = .18, p = .13$). ADHD IN symptoms were significantly correlated with attention scores on the BASCPRS ($r = .49, p < .001$) and BASC-TRS ($r = .32, p = .007$). ODD symptoms were correlated with BASC-PRS aggression ($r = .50, p < .001$), but not with BASC-TRS aggression scores ($r = .01, p = .91$) scale. Similarly, CD symptoms were significantly correlated with BASC-PRS aggression ($r = .58, p < .001$), and the correlation with the BASC-TRS aggression scale approached significance ($r = .21, p = .08$).

Predictive Validity—Predictive validity was evaluated within the externalizing group. Time 1 ADHD HI symptoms predicted Time 2 BASC-TRS hyperactivity scores, above and beyond initial teacher ratings and age, $b = 1.78, SE = .51, p = .001; R^2 = .33; R^2$ change = .12. Similarly, the ADHD IN symptoms predicted BASC-TRS attention problems scores, above and beyond initial teacher ratings and age, $b = 1.05, SE = .49, p = .03; R^2 = .18; R^2$ change = .06. Neither ODD symptoms ($b = -.42, SE = .61, p = .49$) nor CD symptoms ($b = .53, SE = 1.04, p = .61$) predicted BASC-TRS aggression scores, above and beyond initial teacher ratings and age.

We also assessed the extent to which the DISC-IV sections predicted later teacher reports beyond the information obtained on the initial parent rating scale (i.e., BASC-PRS). Time 1 ADHD HI symptoms predicted Time 2 BASC-TRS hyperactivity scores, above and beyond initial parent ratings and age, $b = 2.45, SE = .70, p = .001; R^2 = .22; R^2$ change = .14. Similarly, Time 1 ADHD IN symptoms predicted Time 2 BASC-TRS attention scores, above and beyond initial parent ratings and age, $b = 1.19, SE = .55, p = .03; R^2 = .13; R^2$ change = .06. However, neither Time 1 ODD symptoms nor Time 1 CD symptoms predicted Time 2 BASC-TRS aggression, controlling for initial parent ratings and age, $b = -1.07, SE = .77, p = .17$ and $b = .96, SE = 1.35, p = .48$, respectively.

Discussion

The present study evaluated the reliability, concurrent validity, and predictive validity of the DISC-IV in two samples of preschool children. This structured interview has been shown to be a state-of-the-art diagnostic instrument for school-age children (Shaffer et al. 2000). Our study provides important information about whether it is also a useful assessment measure with preschool children. This adds to the literature on this assessment approach, especially

in evaluating the extent to which symptoms predicted future teacher reports of behavior problems. Concurrent evidence was found across two different time frames in two important groups: a community sample of diverse, mostly low-SES preschoolers, and a sample with high levels of externalizing problems. Results from the current study are quite encouraging for the ADHD section and provide some support for the use of the DISC for the assessment of ODD symptoms in preschool children.

As expected, the ADHD and ODD sections exhibited acceptable internal consistency in Study 1's community sample and Study 2's externalizing group. Both boys and girls exhibited approximately equal internal consistency for the ADHD section. Descriptive differences in internal consistency were found for the ODD and CD by sex, with stronger internal consistency for boys than girls across samples. The CD section exhibited poorer internal consistency in Study 2's externalizing sample. This may have been because of the relatively restricted range in reported symptoms. Some parents endorsed no CD symptoms, and a large number of parents endorsed one CD symptom out of the five symptoms assessed. In addition, some CD symptoms, especially when endorsed in isolation, may represent a developmental stage rather than an indication of true CD.

In terms of concurrent validity, the ADHD and ODD sections of the DISC-IV were significantly correlated with a parent behavior rating scale in Study 1. The ADHD section of the DISC-IV was also related to the teacher rating scale, but the ODD section was not. In Study 2, the externalizing children were easily distinguished from control children in terms of ADHD, ODD, and CD symptoms. In addition, all sections were significantly correlated with a parent behavior rating scale. Only the ADHD IN section was significantly correlated with teachers' reports, while the ADHD HI section approached significance. Overall, the agreement in parents' report between the DISC-IV and behavior rating scales in the two samples suggests that these measures capture perceived symptoms in children. However, only ADHD was consistently correlated with teachers' reports. It has been postulated that context plays a role in mother-teacher agreement for ODD and CD symptoms in preschool children, such that differences in context may explain the lack of concurrent validity between parents and teachers (Strickland et al. 2012). These findings are aligned with theory and research on the development of ODD and CD (Patterson 2002), that suggest symptoms may be expressed first at the home and thus not seen by teachers as often during the preschool years. Nonetheless, the differentiation of externalizing and control children, and the relationships between the DISC-IV and parent ratings on a behavior scale is encouraging with respect to concurrent validity.

We were particularly interested in evaluating the predictive validity of the DISC-IV, given the difficulty and importance of predicting which young children will out-grow problems across time. In study 1, both the ADHD and ODD sections of the DISC-IV predicted future teacher ratings, even controlling for initial teacher ratings. In Study 2, only the ADHD HI and IN sections of the DISC-IV predicted future teacher ratings above and beyond initial teacher ratings. Moreover, in both studies the ADHD section of the DISC-IV added incremental predictive validity above initial parent rating scales. These results, in combination with our previous findings that the DISC-IV scores provided incremental validity in predicting later *parent* rating scale scores (Doctoroff and Arnold 2004), are quite

encouraging. Findings point towards the utility of the DISC-IV for the important task of identifying children at high risk for continuing problems, especially with ADHD.

The present study was conducted with the version of the DISC designed for DSM-IV, but these results are relevant to DSM-5 as well. Changes in DSM-5, with respect to these disorders, were few. ADHD has been placed in the neurodevelopmental disorders chapter in DSM-5 to reflect brain developmental correlates (American Psychiatric Association 2013), but the specific symptoms have not changed. ODD and CD have been moved to the section on Disruptive, Impulse-Control and CDs, but symptoms remain the same. In addition, the current data provide information about the utility of this *method* of assessing symptoms in young children, in addition to information about the specific symptoms themselves.

The present study has a number of limitations. The samples presented were not nationally representative, so we cannot argue that the psychometrics found represent national psychometrics. Nonetheless, the results provide evidence for the utility of the DISC-IV with two different and important samples. Exploratory analyses found that sex was not a moderator in the analyses on the concurrent and predictive validity of the DISC-IV in both samples; however, it should be noted that the size of the two samples in the present study limited the statistical power to potentially find such effects, so future studies should evaluate this question in larger samples. Ethnicity was not assessed as a moderator. Although the diversity of the two samples is a strength, there was not enough power to examine relations separately by ethnicity.

Despite the limitations of the present study, it provides evidence to support the use of the DISC-IV for two important groups of preschoolers—a community sample and an externalizing group. The predictive validity results are especially encouraging for the ADHD section and suggest that the DISC-IV can be a useful tool for research with preschool children and early identification of attention and disruptive behaviors and potentially facilitate appropriate placement in early intervention programs.

References

- Achenbach, TM. Manual for the teacher's report form and 1991 profile. University of Vermont Department of Psychiatry; Burlington: 1991.
- Achenbach T, McConaughy S, Howell C. Child/adolescent behavioral and emotional problems: Implications of cross informant correlations for situational specificity. *Psychological Bulletin*. 1987; 101:213–232. doi:[10.1037/0033-2909.101.2.213](https://doi.org/10.1037/0033-2909.101.2.213). [PubMed: 3562706]
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. text rev. American Psychiatric Publishing; Washington, DC: 2000.
- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. American Psychiatric Publishing; Washington, DC: 2013.
- Anderson SR, Ollendick TH. Diagnosing oppositional defiant disorder using the anxiety disorders interview schedule for DSM-IV: Parent version and the diagnostic interview schedule for children. *Journal of Psychopathology and Behavioral Assessment*. 2012; 34(4):467–475. doi:[10.1007/s10862-012-9294-5](https://doi.org/10.1007/s10862-012-9294-5).
- Angold A, Erkanli A, Copeland W, Goodman R, Fisher PW, Costello EJ. Psychiatric diagnostic interviews for children and adolescents: A comparative study. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2012; 51(5):506–517. doi:[10.1016/j.jaac.2012.02.020](https://doi.org/10.1016/j.jaac.2012.02.020). [PubMed: 22525957]

- Applegate B, Lahey BB, Hart EL, Biederman J, Hynd GW, Barkley RA, Shaffer D. Validity of the age-of-onset criterion for ADHD: A report from the DSM-IV field trials. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1997; 36(9):1211–1221. doi:[10.1097/00004583-199709000-00013](https://doi.org/10.1097/00004583-199709000-00013). [PubMed: 9291722]
- Arnold DH, Zeljo A, Doctoroff GL, Ortiz C. Parent involvement in preschool: Predictors and the relation of involvement to preliteracy development. *School Psychology Review*. 2008; 37(1):74–90.
- Barkley RA, Shelton TL, Crosswait C, Moorehouse M, Fletcher K, Barrett S, Metevia L. Multi-method psycho-educational intervention for preschool children with disruptive behavior: Preliminary results at post-treatment. *Journal of Child Psychology and Psychiatry and Allied Disciplines*. 2000; 41(3):319–332. doi:[10.1111/1469-7610.00616](https://doi.org/10.1111/1469-7610.00616).
- Campbell SB, Ewing LJ, Breaux AM, Szumowski EK. Parent-referred problem three-year-olds: Follow-up at school entry. *Journal of Child Psychology and Psychiatry*. 1986; 27(4):473–488. doi:[10.1111/j.1469-7610.1986.tb00635.x](https://doi.org/10.1111/j.1469-7610.1986.tb00635.x). [PubMed: 3745347]
- Cohen P, O'Connor P, Lewis S, Velez CN, Malachowski B. Comparison of DISC and K-SADS-P interviews of an epidemiological sample of children. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1987; 26(5):662–667. doi:[10.1097/00004583-198709000-00009](https://doi.org/10.1097/00004583-198709000-00009). [PubMed: 3667496]
- Doctoroff GL, Arnold DH. Parent-rated externalizing behavior in preschoolers: The predictive utility of structured interviews, teacher reports, and classroom observations. *Journal of Clinical Child and Adolescent Psychology*. 2004; 33(4):813–818. doi:[10.1207/s15374424jccp3304_16](https://doi.org/10.1207/s15374424jccp3304_16). [PubMed: 15498748]
- Elder TE. The importance of relative standards in ADHD diagnoses: Evidence based on exact birth dates. *Journal of Health Economics*. 2010; 29(5):641–656. <http://www.sciencedirect.com/science/article/pii/S0167629610000755>. [PubMed: 20638739]
- Eyberg, SM.; Pincus, D. Eyberg child behavior inventory and sutter-eyberg student behavior inventory-revised professional manual. Psychological Assessment Resources; Odessa, FL: 1999.
- Fagot BI, Leve LD. Teacher ratings of externalizing behavior at school entry for boys and girls: Similar early predictors and different correlates. *Journal of Child Psychology and Psychiatry*. 1998; 39(555):566. doi:[10.1017/S002196309800225X](https://doi.org/10.1017/S002196309800225X).
- Fisher, PW.; Lucas, C.; Shaffer, D. Diagnostic interview schedule for children, version IV (DISC IV): Test–retest reliability in a clinical sample. Presented at the 44th Annual Meeting of the American Academy of Child and Adolescent Psychiatry; Toronto. 1997.
- Fisher, P.; Wicks, J.; Shaffer, D.; Piacentini, J.; Lapkin, J. Diagnostic interview schedule for children. New York State Psychiatric Institute; New York: 1994.
- Frick, PJ.; McMahon, RJ. Child and adolescent conduct problems. In: Hunsley, J.; Mash, EJ., editors. A guide to assessments that work. Oxford University Press; New York: 2008. p. 41–66.
- Friman PC, Handwerk ML, Smith GL, Larzelere RE, Lucas CP, Shaffer DM. External validity of conduct and oppositional defiant disorders determined by the NIMH diagnostic interview schedule for children. *Journal of Abnormal Child Psychology*. 2000; 28(3):277–286. doi:[10.1023/A:1005148404980](https://doi.org/10.1023/A:1005148404980). [PubMed: 10885685]
- George, D.; Mallery, P. SPSS for windows step by step: A simple guide and reference. 11.0 update. 4th ed. Allyn & Bacon; Boston: 2003.
- Graves S, Blake J, Kim E. Differences in parent and teacher ratings of preschool problem behavior in a national sample: The significance of gender and SES. *Journal of Early Intervention*. 2012; 34(3): 151–165. doi:[10.1177/1053815112461833](https://doi.org/10.1177/1053815112461833).
- Harvey EA, Friedman-Weieneth JL, Goldstein L, Sherman A. Examining subtypes of behavior problems among 3-year-old children, Part I: Investigating validity of subtypes and biological risk-factors. *Journal of Abnormal Child Psychology*. 2007; 35:97–110. [PubMed: 17165141]
- Harvey EA, Lugo-Candelas CI, Breaux RP. Longitudinal changes in individual symptoms across the preschool years in children with ADHD. *Journal of Clinical Child and Adolescent Psychology*. 2014 doi:[10.1080/15374416.2014.886253](https://doi.org/10.1080/15374416.2014.886253).
- Harvey EA, Youngwirth SD, Thakar DA, Errazuriz PA. Predicting attention-deficit/hyperactivity disorder and oppositional defiant disorder from preschool diagnostic assessments. *Journal of*

- Consulting and Clinical Psychology. 2009; 77(2):349–354. doi:[10.1037/a0014638](https://doi.org/10.1037/a0014638). [PubMed: 19309194]
- Hayden EP, Klein DN, Durbin CE. Parent reports and laboratory assessments of child temperament: A comparison of their associations with risk for depression and externalizing disorders. *Journal of Psychopathology and Behavioral Assessment*. 2005; 27:89–100. doi:[10.1007/s10862-005-5383-z](https://doi.org/10.1007/s10862-005-5383-z).
- Ivanova MY, Achenbach TM, Rescorla LA, Bilenberg N, Bjarnadottir G, Denner S, Verhulst FC. Syndromes of preschool psychopathology reported by teachers and caregivers in 14 societies using the caregiver-teacher report form (C-TRF). *Journal of Early Childhood and Infant Psychology*. 2011:83–103.
- Jensen PS, Salzberg AD, Richters JE, Watanabe HK. Scales, diagnoses, and child psychopathology: I. CBCL and DISC relationships. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1993; 32(2):397–406. doi:[10.1097/00004583-199303000-00022](https://doi.org/10.1097/00004583-199303000-00022). [PubMed: 8444770]
- Jensen-Doss A. Evidence-based diagnosis: Incorporating diagnostic instruments into clinical practice. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2005; 44(9):947–952. doi:[10.1097/01.chi.0000171903.16323.92](https://doi.org/10.1097/01.chi.0000171903.16323.92). [PubMed: 16113624]
- Kasius MC, Ferdinand RF, van den Berg H, Verhulst FC. Associations between different diagnostic approaches for child and adolescent psychopathology. *Journal of Child Psychology and Psychiatry*. 1997; 38(6):625–632. doi:[10.1111/j.1469-7610.1997.tb01689.x](https://doi.org/10.1111/j.1469-7610.1997.tb01689.x). [PubMed: 9315972]
- Keenan K, Boeldt D, Chen D, Coyne C, Donald R, Duax J, Humphries M. Predictive validity of DSM-IV oppositional defiant and conduct disorders in clinically referred preschoolers. *Journal of Child Psychology and Psychiatry*. 2011; 52(1):47–55. doi:[10.1111/j.1469-7610.2010.02290.x](https://doi.org/10.1111/j.1469-7610.2010.02290.x). [PubMed: 20738448]
- Keenan K, Wakschlag LS. Are oppositional defiant and conduct disorder symptoms normative behaviors in preschoolers? A comparison of referred and nonreferred children. *The American Journal of Psychiatry*. 2004; 161(2):356–358. [PubMed: 14754786]
- Kerr DR, Lunkenheimer ES, Olson SL. Assessment of child problem behaviors by multiple informants: A longitudinal study from preschool to school entry. *Journal of Child Psychology and Psychiatry*. 2007; 48(10):967–975. doi:[10.1111/j.1469-7610.2007.01776.x](https://doi.org/10.1111/j.1469-7610.2007.01776.x). [PubMed: 17914997]
- Korsch F, Petermann F. Agreement between parents and teachers on preschool children's behavior in a clinical sample with externalizing behavioral problems. *Child Psychiatry and Human Development*. 2013 doi:[10.1007/s10578-013-0430-6](https://doi.org/10.1007/s10578-013-0430-6).
- Krol NM, De Bruyn EJ, Coolen JC, van Aarle EM. From CBCL to DSM: A comparison of two methods to screen for DSM-IV diagnoses using CBCL data. *Journal of Clinical Child and Adolescent Psychology*. 2006; 35(1):127–135. doi:[10.1207/s15374424jccp3501_11](https://doi.org/10.1207/s15374424jccp3501_11). [PubMed: 16390308]
- Lahey BB, Pelham WE, Loney J, Kipp H, Ehrhardt A, Lee SS, Massetti G. Three-year predictive validity of DSM-IV attention deficit hyperactivity disorder in children diagnosed at 4–6 years of age. *The American Journal of Psychiatry*. 2004; 161(11):2014–2020. doi:[10.1176/appi.ajp.161.11.2014](https://doi.org/10.1176/appi.ajp.161.11.2014). [PubMed: 15514401]
- Lavigne JV, Arend R, Rosenbaum D, Binns HJ, Christoffel KK, Gibbons RD. Psychiatric disorders with onset in the pre-school years: II. Correlates and predictors of stable case status. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1998; 37:1255–1261. [PubMed: 9847497]
- Lavigne JV, Cicchetti C, Gibbons RD, Binns HJ, Larsen L, Devito C. Oppositional defiant disorder with onset in preschool years: Longitudinal stability and pathways to other disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001; 40:1393–1400. [PubMed: 11765284]
- Lavigne JV, LeBailly SA, Hopkins J, Gouze KR, Binns HJ. The prevalence of ADHD, ODD, depression, and anxiety in a community sample of 4-year-olds. *Journal of Clinical Child and Adolescent Psychology*. 2009; 38(3):315–328. doi:[10.1080/15374410902851382](https://doi.org/10.1080/15374410902851382). [PubMed: 19437293]
- Lee SS, Lahey BB, Owens EB, Hinshaw SP. Few preschool boys and girls with ADHD are well-adjusted during adolescence. *Journal of Abnormal Child Psychology*. 2008; 36(3):373–383. doi:[10.1007/s10802-007-9184-6](https://doi.org/10.1007/s10802-007-9184-6). [PubMed: 17914666]

- Loeber R, Burke JD, Lahey BB, Winters A, Zera M. Oppositional defiant and conduct disorder: A review of the past 10 years, part I. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2000; 39(12):1468–1484. doi:[10.1097/00004583-200012000-00007](https://doi.org/10.1097/00004583-200012000-00007). [PubMed: 11128323]
- McGoey KE, Eckert TL, DuPaul GJ. Early intervention for preschool-age children with ADHD: A literature review. *Journal of Emotional and Behavioral Disorders*. 2002; 10(1):14–28. doi:[10.1177/106342660201000103](https://doi.org/10.1177/106342660201000103).
- McGrath AM, Handwerk ML, Armstrong KJ, Lucas CP, Friman PC. The validity of the ADHD section of the diagnostic interview schedule for children. *Behavior Modification*. 2004; 28(3):349–374. doi:[10.1177/0145445503258987](https://doi.org/10.1177/0145445503258987). [PubMed: 15104867]
- Mesman J, Koot HM. Early preschool predictors of preadolescent internalizing and externalizing DSM-IV diagnoses. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2001; 40(9):1029–1036. doi:[10.1097/00004583-200109000-00011](https://doi.org/10.1097/00004583-200109000-00011). [PubMed: 11556626]
- Moffitt TE. Juvenile delinquency and attention deficit disorder: Boys' developmental trajectories from age 3 to age 15. *Child Development*. 1990; 61(3):893–910. doi:[10.2307/1130972](https://doi.org/10.2307/1130972). [PubMed: 2364762]
- Ostrander R, Weinfurt KP, Yarnold PR, August GJ. Diagnosing attention deficit disorders with the behavioral assessment system for children and the child behavior checklist: Test and construct validity analyses using optimal discriminant classification trees. *Journal Of Consulting And Clinical Psychology*. 1998; 66(4):660–672. doi:[10.1037/0022-006X.66.4.660](https://doi.org/10.1037/0022-006X.66.4.660). [PubMed: 9735584]
- Patterson, GR. The early development of coercive family process. In: Reid, JB.; Patterson, GR.; Snyder, J., editors. *Antisocial behavior in children and adolescents: A developmental analysis and model for intervention*. American Psychological Association; Washington, DC, USA: 2002. p. 25–44.
- Reynolds, CR.; Kamphaus, RW. *Behavior assessment system for children manual*. American Guidance Service; Circle Pines, MN: 1992.
- Reynolds LK, Kelley ML. The efficacy of a response cost-based treatment package for managing aggressive behavior in preschoolers. *Behavior Modification*. 1997; 21(2):216–230. doi:[10.1177/01454455970212005](https://doi.org/10.1177/01454455970212005). [PubMed: 9086867]
- Riddle MA, Yershova K, Lazzaretto D, Paykina N, Yenokyan G, Greenhill L, Posner K. The preschool attention-deficit/hyperactivity disorder treatment study (PATS) 6-year follow-up. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2013; 52(3):264–278. doi:[10.1016/j.jaac.2012.12.007](https://doi.org/10.1016/j.jaac.2012.12.007). [PubMed: 23452683]
- Rolon-Arroyo B, Arnold DH, Harvey EA. The predictive utility of conduct disorder symptoms in preschool children: A 3-year follow-up study. *Child Psychiatry and Human Development*. 2014; 45(3):329–337. doi:[10.1007/s10578-013-0404-8](https://doi.org/10.1007/s10578-013-0404-8). [PubMed: 23979222]
- Schwab-Stone ME, Shaffer D, Dulcan MK, Jensen PS, Fisher P, Bird HR, Rae DS. Criterion validity of the NIMH diagnostic interview schedule for children version 2.3 (DISC-2.3). *Journal of the American Academy of Child and Adolescent Psychiatry*. 1996; 35(7):878–888. doi:[10.1097/00004583-199607000-00013](https://doi.org/10.1097/00004583-199607000-00013). [PubMed: 8768347]
- Shaffer D, Fisher P, Lucas CP, Dulcan MK, Schwab-Stone ME. NIMH diagnostic interview schedule for children version IV (NIMH DISC-IV): Description, differences from previous versions, and reliability of some common diagnoses. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2000; 39(1):28–38. doi:[10.1097/00004583-200001000-00014](https://doi.org/10.1097/00004583-200001000-00014). [PubMed: 10638065]
- Speltz ML, McClellan J, DeKlyen M, Jones K. Preschool boys with oppositional defiant disorder: Clinical presentation and diagnostic change. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1999; 38(7):838–845. doi:[10.1097/00004583-199907000-00013](https://doi.org/10.1097/00004583-199907000-00013). [PubMed: 10405501]
- Strickland J, Hopkins J, Keenan K. Mother-teacher agreement on preschoolers' symptoms of ODD and CD: Does context matter? *Journal of Abnormal Child Psychology*. 2012; 40(6):933–943. doi:[10.1007/s10802-012-9622-y](https://doi.org/10.1007/s10802-012-9622-y). [PubMed: 22661105]
- Waschbusch DA. A meta-analytic examination of comorbid hyperactive-impulsive-attention problems and conduct problems. *Psychological Bulletin*. 2002; 128(1):118–150. [PubMed: 11843545]

- Webster-Stratton C, Reid MJ, Hammond M. Preventing conduct problems, promoting social competence: A parent and teacher training partnership in head start. *Journal of Clinical Child Psychology*. 2001; 30(3):283–302. doi:[10.1207/S15374424JCCP3003_2](https://doi.org/10.1207/S15374424JCCP3003_2). [PubMed: 11501247]
- Willoughby MT, Pek J, Greenberg MT, The Family Life Project Investigators. Parent-reported attention deficit/hyperactivity symptomatology in preschool-aged children: Factor structure, developmental change, and early risk factors. *Journal of Abnormal Child Psychology*. 2012; 40(8): 1301–1312. doi:[10.1007/s10802-012-9641-8](https://doi.org/10.1007/s10802-012-9641-8). [PubMed: 22581375]

Table 1

Study 1. Overall means and comparisons by sex of DISC-IV sections, ECBI, and C-TRF subscales

Measure	Boys (<i>n</i> = 65)	Girls (<i>n</i> = 63)	<i>t</i>	<i>d</i>	Total
DISC-IV (parents)					
Time 1 ADHD total	4.25 (3.24)	2.95 (2.73)	2.44 **	0.43	3.61 (3.06)
ADHD HI	3.08 (2.32)	2.11 (1.97)	2.54 **	0.45	2.60 (2.20)
ADHD IN	1.17 (1.49)	0.84 (1.18)	1.38	0.25	1.01 (1.35)
Time 1 ODD	1.15 (1.78)	0.56 (1.03)	2.34 **	0.41	0.86 (1.48)
EBCI (parents)					
Time 1 ECBI	2.95 (.84)	3.06 (.86)	0.70	0.13	3.00 (.85)
C-TRF (teachers)					
Time 1 attention	53.22 (4.94)	53.41 (5.34)	0.21	0.04	53.31 (5.12)
Time 1 externalizing	54.18 (8.72)	55.86 (8.98)	1.09	0.19	55.01 (8.85)
Time 2 attention	52.64 (6.17)	52.15 (3.75)	0.47	0.09	52.40 (5.12)
Time 2 externalizing	54.05 (9.52)	55.96 (9.80)	0.96	0.20	54.97 (9.65)

DISC-IV Diagnostic Interview Schedule for Children, *ADHD* attention deficit/hyperactivity disorder, *HI* hyperactivity/impulsivity type, *IN* inattentive type, *ODD* oppositional defiant disorder, *ECBI* Eyberg child behavior inventory, *C-TRF* caregiver-teacher report form. At Time 2 there were 49 boys and 45 girls. Standard deviations are presented in parentheses

**
p < .01

Table 2

Study 1. Intercorrelations between DISC-IV sections (parents), ECBI (parents), and C-TRF (teachers) scores

	1	2	3	4	5	6	7
1. Time 1 DISC-IV ADHD total	–	.38 **	.47 **	.26 **	.25 **	.39 **	.31 **
2. Time 1 DISC-IV ODD		–	.35 **	–.05	–.04	.06	.15
3. Time 1 ECBI			–	.16	.24 **	.10	.24 *
4. Time 1 C-TRF attention problems				–	.59 **	.77 **	.47 **
5. Time 1 C-TRF externalizing					–	.51 **	.79 **
6. Time 2 C-TRF attention						–	.52 **
7. Time 2 C-TRF externalizing							–

DISC-IV Diagnostic Interview Schedule for Children, *ADHD* attention deficit/hyperactivity disorder, *ODD* oppositional defiant disorder, *ECBI* Eyberg Child Behavior Inventory, *C-TRF* caregiver-teacher report form

* $p < .05$;

** $p < .01$

Table 3

Internal consistencies of DISC-IV sections by sex

Measure	Study 1			Study 2		
	Boys	Girls	Total	Boys	Girls	Total
<i>DISC-IV</i>						
ADHD total	.78	.75	.77	.81	.80	.80
ADHD HI	.73	.70	.72	.69	.58	.64
ADHD IN	.66	.54	.62	.66	.76	.71
ODD	.80	.59	.75	.77	.68	.73
CD	–	–	–	.42	.28	.36

DISC-IV Diagnostic Interview Schedule for Children, *ADHD HI* attention deficit/hyperactivity disorder, predominantly hyperactive/impulsive Type, *ADHD IN* attention deficit/hyperactivity disorder, predominantly inattentive type, *ODD* oppositional defiant disorder

Table 4

Study 2. Within and between group comparisons of time 1 DISC-IV in control and externalizing group

Measure DISC-IV	Control group				Externalizing group				Control versus externalizing <i>d</i>
	Boys (<i>n</i> = 17)	Girls (<i>n</i> = 8)	<i>d</i>	Total	Boys (<i>n</i> = 41)	Girls (<i>n</i> = 31)	<i>d</i>	Total	
ADHD HI	2.71 (1.49)	1.63 (0.74)	0.92	2.36 (1.38)	5.34 (2.10)	5.00 (1.84)	0.15	5.19 (1.99)	1.65***
ADHD IN	0.94 (1.09)	1.00 (1.31)	0.05	0.96 (1.14)	3.61 (2.13)	3.74 (2.42)	0.06	3.67 (2.25)	1.52***
ODD	1.41 (1.77)	1.38 (2.00)	0.02	1.40 (1.80)	4.61 (2.07)	4.32 (1.89)	0.15	4.49 (1.99)	1.63***
CD	0.35 (0.86)	0.75 (0.71)	0.50	0.48 (0.82)	1.46 (1.32)	1.35 (1.20)	0.09	1.42 (1.26)	0.88***

DISC-IV Diagnostic Interview Schedule for Children, Fourth Edition, *ADHD* attention deficit/hyperactivity disorder, *ODD* oppositional defiant disorder, *CD* conduct disorder. Standard deviations are presented in parentheses

p < .001

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 5

Study 2. Time 1 intercorrelations between DISC-IV sections (parents), BASC-PRS (parents), and BASC-TRS (teachers) scores

	1	2	3	4	5	6	7	8	9	10
1. Time 1 DISC ADHD hyperactivity	–	.65***	.05	.05	.63***	.35**	.09	.18	.22	.13
2. Time 1 DISC ADHD inattention		–	.15	.18	.61***	.49***	.17	.31**	.32**	.18
3. Time 1 DISC ODD			–	.34**	.18	.15	.50***	–.02	–.11	.01
4. Time 1 DISC CD				–	.30**	.22	.58**	.23	.16	.21
5. Time 1 BASC-PRS hyperactivity					–	.57**	.41***	.29*	.28*	.26*
6. Time 1 BASC-PRS attention						–	.29*	.29*	.16	.16
7. Time 1 BASC-PRS aggression							–	.23	.11	.37**
8. Time 1 BASC-TRS hyperactivity								–	.69***	.69***
9. Time 1 BASC-TRS attention									–	.57***
10. Time 1 BASC-TRS aggression										–

DISC-IV Diagnostic Interview Schedule for Children, Fourth Edition, *ADHD* attention deficit/hyperactivity disorder, *ODD* oppositional defiant disorder, *CD* conduct disorder, *BASC-PRS* Behavior Assessment System for Children-Parent Rating Scale, *BASC-TRS* Behavior Assessment System for Children-Teacher Rating Scale

* $p < .05$;

** $p < .01$;

*** $p < .001$