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Predicting Attention-Deficit/Hyperactivity Disorder and Oppositional Defiant Disorder from Preschool Diagnostic Assessments

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Abstract

The present study examined the power of measures of early preschool behavior to predict later diagnoses of attention-deficit/hyperactivity disorder (ADHD) and oppositional defiant disorder (ODD)/conduct disorder (CD). Participants were 168 children with behavior problems at age 3 who underwent a multi-method assessment of ADHD and ODD symptoms and were followed annually for 3 years. Fifty-eight percent of 3-year-old children with behavior problems met criteria for ADHD and/or ODD/CD 3 years later. Using a diagnostic interview and rating scales at age 3, later diagnostic status could be accurately predicted for three-quarters of children for ADHD and for two-thirds of children for ODD/CD. Predictive power of the best models did not increase significantly at age 4 and age 5 compared to age 3. Results provide support for the validity of early diagnoses of ADHD, though caution is needed in making diagnoses because a significant minority of children with early hyperactivity and inattention do outgrow their problems.

Keywords

ADHD; ODD; preschool-aged children; assessment

Attention-deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD) are not typically diagnosed until school-age, but often emerge during the preschool years (Applegate et al., 1997). Prospective studies of community samples have documented that early behavior problems are linked to later difficulties (e.g., Moffitt, 1990), but only a small number of studies arising from six longitudinal data sets have addressed the frequency with which preschool-aged children (under age 5) with behavior problems later meet criteria for ADHD or ODD (Beitchman, Wekerle, & Hood, 1987; Campbell & Ewing, 1990; Campbell, Ewing, Breaux, & Szumowski, 1986; Campbell, Pierce, Moore, & Marakovitz, 1996; Lahey et al., 2004; Lahey, Pelham, Loney, Lee, & Willcutt, 2005; Lavigne et al., 1998; Lavigne et al., 2001; Pierce, Ewing, & Campbell, 1999; Speltz,

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McClellan, DeKlyen, & Jones, 1999). These studies have generally found that approximately half of younger preschool-aged children and two-thirds to three-quarters of older preschool-aged children with behavior problems met criteria for ADHD and/or ODD in follow-up assessments that ranged from 2 to 10 years later.

Although these are groundbreaking studies, more research is needed. Only three of these data sets (Campbell et al., 1986, 1996; Lavigne et al., 1998; Pierce et al., 1999) have focused specifically on preschool children under age 4, when these disorders are thought to first emerge (Applegate et al., 1997). None of these three used a structured DSM-based diagnostic interview to assess early preschool symptoms or compared the predictive power of different types of diagnostic information. Furthermore, they yielded only small numbers (10 to 20) of children with later ADHD and only Pierce et al. (1999) examined ADHD and ODD outcome separately. Among studies of older preschool-age children, only Lahey et al. (2004; 2005) focused on a sample that yielded a substantial number of children with later ADHD, but only one-third of the sample was preschool-aged. Studies have not yet directly examined the age at which diagnostic assessments can predict later ADHD or ODD with adequate power, and which methods are most accurate in predicting later diagnoses. Between-subjects comparisons suggest that stability of these disorders is higher among older preschool-aged children compared to younger children, but within-subjects comparisons are needed to rule out effects of sample differences.

The present study examines the degree to which early measures of behavior discriminate preschool children with behavior problems who later meet criteria for ADHD and/or ODD/CD¹ from those who outgrow their problems. In particular, this study addresses the following questions: a) How accurately does a DSM-based diagnostic interview predict later ADHD and ODD/CD among younger preschool-aged children with behavior problems? b) Do mothers', fathers', and teachers' rating scales and direct observations add additional predictive power? c) Do diagnostic interviews and parent rating scales predict later diagnoses more accurately when administered in the later preschool years than when administered at age 3? This study also explored possible gender differences in predictive power.

Method

Participants and Procedure

Participants were 168 children (91 boys, 77 girls), their 168 female primary caregivers (162 biological mothers, 4 adoptive mothers, and 2 grandmothers, to whom we will refer as *mothers*) and 121 male caregivers (110 biological fathers, 3 adoptive fathers, 6 stepfathers, and 2 grandfathers, to whom we will refer as *fathers*) who completed a 4-year longitudinal study of preschool children with behavior problems. Children were 3 years old at screening

¹ODD and CD have been conceptualized as closely related disorders, with ODD commonly escalating into CD. Based on DSM-IV criteria, CD supersedes ODD as a diagnosis. While most children with behavior problems at age 6 are likely to still be displaying milder symptoms characteristic of ODD, a few may already be starting to show more severe symptoms typical of CD. Because we did not expect to have enough children meeting criteria for CD to examine ODD and CD separately, ODD and CD were combined together into a single ODD/CD category. However, because CD symptoms were only starting to emerge at age 6 for a few children, preschool ODD symptoms, and not CD symptoms were used as predictors.

and 36 to 50 months ($M = 44$ months, $SD = 3$) at the first home visit (Time 1; $n = 168$). Data were collected from these families at 1-year (Time 2; $n = 166$), 2-year (Time 3; $n = 157$), and 3-year (Time 4, $n = 168$) follow-up visits. The average age at Time 4 was 81 months ($SD = 5$). The sample included European American (54%), Latino (23%; mostly Puerto Rican), African American (10%), and multiethnic (14%) children. The median family income at Time 1 was \$47,108.

Parents of 1752 3-year-old children completed a screening packet including the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992). Inclusion criteria were: (a) parent responded “yes” or “possibly” to, “Are you concerned about your child’s activity level, defiance, aggression, or impulse control?” and (b) BASC Hyperactivity and/or Aggression subscale T scores at least 65 (see Harvey, Friedman-Weieneth, Goldstein, & Sherman, 2007 for more detail). Of the 1752 children, 411 met criteria a and b, and were not ruled out for language, mental, or physical problems. We attempted to contact 340 of these children and 199 were enrolled in the study at Time 1. Children ($n = 168$) who completed follow-up assessments 3 years later (Time 4) are the focus of this study (31 of the original 199 dropped out after Time 1). Families were paid for their participation. Written informed consent was obtained from parents and the study was conducted in compliance with the authors’ Internal Review Board.

Measures

Parent completed diagnostic interview—At Times 1, 2, and 3, the ADHD and ODD sections of the NIMH-Diagnostic Interview Schedule for Children-IV (DISC-IV; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) were administered to parents, with minor modification to school-related questions. The full computerized version of the DISC-IV was administered at Time 4. Interviews were administered to the primary caregiver. Fathers also participated in the interviews for 64% of children at Time 1, 42% at Time 2, 22% at Time 3, and 32% at Time 4. Primary caregivers’ responses were used in the rare case of disagreement between mother and father. DSM-IV symptom counts were calculated at each time point for hyperactivity/impulsivity (HI), inattention (ATT), and oppositional-defiance (OD). Cronbach’s α at Time 1 was .83 for ATT, .76 for HI, and .79 for OD, which were only slightly lower than at Time 4 (ATT = .87, HI = .82, OD = .80). The DISC-IV also assesses symptom impairment. Impairment items were scored from 0 to 3 and summed separately for HI, ATT, and OD. At Times 1, 2, and 3, impairment questions concerning schoolwork and teachers were omitted. In the present study, the DISC-IV was fairly stable across time for HI (r s ranged from .44 to .65, p s < .001) and ATT symptoms (.37 to .68, p s < .001), with somewhat lower stability for OD (.25 to .51, p s < .01).

Parent and teacher rating scales— T scores² for the Hyperactivity, Attention Problems, and Aggression subscales of the BASC were used (Preschool version at Times 1, 2, and 3, and Child version at Time 4). These subscales have demonstrated good reliability (Reynolds & Kamphaus, 1992). Among the 168 families, the BASC was completed by 167

²General rather than gender-specific norms were used because gender differences in prevalence rates of ADHD and ODD/CD symptoms have been well-documented. Use of gender-specific norms would likely overidentify girls with ADHD and ODD/CD.

mothers and 121 fathers at Time 1, by 165 mothers and 116 fathers at Time 2, and by 152 mothers and 103 fathers at Time 3. The BASC-Teacher Rating Scale was completed for 88 children at Time 1 (76% of 112 children who were in regular preschool or child care) and for 127 children at Time 4. Large intercorrelations were found between Time 2, 3, and 4 measures for mothers' and fathers' BASC subscales (r s ranged from .47 to .78, $ps < .001$). Correlations between Time 1 and Time 2, 3, and 4 BASC subscales fell in the medium to large range (.41 to .63, $ps < .001$), with the exception of father BASC Attention Problems which fell in the small to medium range ($r = .30$, $p < .01$ for Time 1 to Time 2, $r = .25$, $p < .05$ for Time 1 to Time 3, and $r = .10$, $p = \text{n.s.}$ for Time 1 to Time 4). Time 1 and Time 4 Teacher BASC subscales were significantly correlated (r s = .48, $p < .001$ for Aggression and Hyperactivity, $r = .30$, $p < .05$ for Attention Problems). The Disruptive Behavior Rating Scale (Barkley & Murphy, 1998) was administered to parents and teachers at Time 4 to aid clinician-based diagnoses (see below).

Videotaped assessment of child behavior—At Time 1, children were videotaped during cognitive testing and a parent-child interaction (see Harvey et al., 2007). Trained coders rated children on 5-point scales on noncompliance (*intraclass correlations* [ICC] of average ratings across the two tasks = .88), defiance/aggression ($ICC = .79$), negative affect ($ICC = .80$), inattention ($ICC = .80$), and activity level ($ICC = .82$). Logarithmic transformations were conducted on skewed coding variables. Activity level and inattention were correlated, $r = .71$, $p < .001$, and were averaged, as were observed non-compliance, defiance, and negative affect (all r s $> .58$, $ps < .001$).

Time 4 ADHD and ODD/CD diagnoses—Clinicians assigned diagnoses of ADHD, ODD, and CD based on interviews and ratings scales collected at Time 4. To be consistent with Lahey et al. (2005), ADHD diagnoses were given if clinically significant symptoms were evident at home or at school. A second clinician reviewed Time 4 materials and made independent diagnoses. Discrepancies were discussed and a consensus diagnosis was reached. Kappa was .78 for ADHD, .75 for ODD, and 1.00 for CD. Of the 168 children, 32 (17 boys, 15 girls) met criteria for ADHD only, 22 (13 boys, 9 girls) for ODD only, and 43 (29 boys, 14 girls) for ADHD and ODD/CD (4 children met criteria for CD). Among children who met criteria for ADHD, 22 showed significant symptoms at home only. Time 4 measures of hyperactivity and impulsivity (DISC-IV and BASC scores) were all significantly associated with ADHD diagnoses (all $ps < .001$) and Time 4 measures of ODD/aggression were all significantly associated with ODD diagnoses (all $ps < .01$), supporting the validity of the clinician-based diagnoses.

Results

For 56 children, teacher data were missing at Time 1 because the child was not in preschool or childcare, and for 24 children, data were missing because the teacher failed to complete a BASC. Father data were missing for 21 children at Time 1 and 18 children at Times 2 and 3 because the children did not have father-figures involved in their lives. Among children whose fathers were active in their lives, father data were missing for 26 children at Time 1, 34 at Time 2, and 47 at Time 3. Multiple imputation was used to estimate missing data using the MIANALYZE procedure in SAS. Data were imputed separately for ADHD and for

ODD/CD models and five sets of imputations were generated. To take into account possible differences between data that were missing because the father/teacher was not active in the child's life and data that were missing because a father/teacher chose not to participate, two dummy coded variables (father presence, teacher presence) were created to indicate whether each child had a teacher or a father involved in the child's life. All predictor and outcome variables, maternal and paternal education, gender, and the father/teacher presence variables were used to impute data³. Teacher and father models were also tested without imputed data and results were generally similar to those with imputed data. The few exceptions are noted in the tables.

To consider the potential influence of differential attrition, the 168 children who participated at Time 4 were compared to the 31 children who dropped out after Time 1 on maternal education, gender, and all Time 1 through 3 predictors. There were significant differences on only two variables: Children who dropped out were rated higher than children who remained in the study on teacher BASC Hyperactivity and Aggression subscales ($ps < .01$).

Predictive Power of Time 1 Measures

Using logistic regression to predict ADHD and ODD/CD, DISC-IV symptoms were entered first alone and then together with each of the following sets of variables: maternal BASC, paternal BASC, teacher BASC, and observed behavior. Predicted classifications were compared to actual diagnoses, selecting cutoffs such that the number of children who were predicted to have the disorder was similar to the base rate at Time 4. Guided by studies that have examined the predictive power of tests to classify children with ADHD (e.g., Grodzinsky & Barkley, 1999), we considered overall predictive power (OPP; the percent of children accurately classified) greater than .8 as high, between .7 and .8 as relatively good, between .6 and .7 as fair, and less than .6 as poor. The 6 children with ADHD Predominantly Inattentive Type at Time 4 were not included in analyses predicting later ADHD, because this subtype is thought to be quite distinct from other subtypes of ADHD, with a later age of onset (Barkley, 1997), and the screening process for this study was not designed to identify children at risk for this subtype. Analyses are presented for the entire sample. Results did not change substantially if children who showed Time 4 ADHD symptoms only at home were excluded. There were not significant differences in OPP when analyses were conducted separately for boys and for girls.

The Time 1 DISC-IV yielded fair OPP for predicting Time 4 ADHD (.69; Table 1) and ODD/CD (.67; Table 2). The DISC-IV plus maternal BASC model and DISC-IV plus teacher BASC model were significantly better than the DISC-IV only model for predicting later ADHD, but only the maternal model yielded better OPP (.76) than the DISC-IV only model. Mother, father, teacher, and observed behavior models were all significantly better than the DISC-IV alone model for predicting later ODD/CD, but did not result in substantially better OPP.

³The imputation model for ADHD did not include Time 4 DISC-IV and BASC hyperactivity/inattention variables because the model would not converge within reasonable ranges for some Time 1 BASC variables when the Time 4 variables were included. Correlations describing characteristics of variables in the Method section are based on actual rather than imputed data.

Comparison of Time 1, Time 2, and Time 3 Predictive Power

For Time 2 and 3 models predicting later ADHD (see Table 3), OPP for the Time 3 DISC-IV only model was significantly greater than for the Time 1 DISC-IV only model, $\chi^2(1, N = 162) = 5.16, p < .05$, but there was no significant difference between the Time 2 and Time 1 DISC-IV only models, $\chi^2(1, N = 162) = 2.63, p = \text{n.s.}$ OPPs for predicting later ADHD from Time 2 and Time 3 DISC-IV and maternal BASC were not significantly different from OPP for the Time 1 DISC-IV plus maternal BASC model, $\chi^2(1, N = 162) = .42$ and $.76$, respectively. OPP for predicting ADHD from the Time 3 DISC-IV and paternal BASC was significantly greater than OPP using the Time 1 DISC-IV and paternal BASC, $\chi^2(1, N = 162) = 5.16, p < .05$; however, there was no significant difference between the Time 2 and Time 1 paternal models, $\chi^2(1, N = 162) = 2.63, p = \text{n.s.}$ There were no significant differences (all $ps > .10$) between the best models for predicting ADHD at Time 1, Time 2, and Time 3.

For models predicting later ODD/CD, OPPs for the Time 2 and Time 3 DISC-IV only models were not significantly different from the OPP for the Time 1 DISC-IV only model, $\chi^2(1, N = 168) = .15$ and 1.44 , respectively. OPP for predicting ODD/CD from the Time 3 DISC-IV and maternal BASC was significantly greater than OPP using the Time 1 DISC-IV and maternal BASC, $\chi^2(1, N = 168) = 3.86, p < .05$, but there was no significant difference between the Time 2 and Time 1 DISC-IV plus maternal BASC models, $\chi^2(1, N = 168) = 1.35, p = \text{n.s.}$ OPPs for predicting ODD/CD from the Time 2 and Time 3 DISC-IV and paternal BASC were not significantly different from the OPP for the Time 1 DISC-IV plus paternal BASC model, $\chi^2(1, N = 168) = .35$ and 3.34 , respectively. A comparison of the best models for ODD/CD at Time 1, Time 2, and Time 3 indicated no significant differences in OPP, all $ps > .05$.

Discussion

This study examined the power of multiple methods of behavior assessment during the preschool years to predict later diagnoses of ADHD and ODD/CD. Consistent with previous research (Campbell et al., 1986), roughly half of younger preschool-aged children with behavior problems later met criteria for ADHD and/or ODD/CD. Combining a DSM-IV-based diagnostic interview and a standardized rating scale, children with ADHD could be discriminated from those with transient problems as early as age 3 with reasonable accuracy (76%), comparable to rates found in previous research with older preschoolers (Lahey et al., 2004; 2005). Teachers', mothers', and observers' ratings at age 3 were associated with later ADHD (see Table 1), but only mothers' ratings significantly improved the power to predict later ADHD, over and above a diagnostic interview. ODD symptoms at age 3 as measured by a diagnostic interview predicted later ODD/CD with 66% accuracy. Fathers', mothers', and observers' ratings were associated with later ODD/CD (see Table 2), but did not substantially improve on OPP of the diagnostic interview. OPP for the best models predicting later ADHD and ODD/CD did not increase significantly during the later preschool years.

Although many 3-year-old children who were predicted to have ADHD or ODD/CD met criteria 3 years later, a sizable minority did not (27% for the best ADHD model and 42% for

the best ODD/CD model), pointing to the need for a balanced approach to early identification and treatment for these disorders. A wait-and-see approach misses an opportunity for early intervention for children whose early behavior problems represent a stable condition. At the same time, an approach is needed that does not unnecessarily label children whose problems are transient, or expose them to treatments with potential negative side effects. Such an approach might include making provisional diagnoses and referring families for relatively low risk psychosocial interventions such as parent training.

Several limitations of this study should be noted. First, caution should be taken in generalizing findings to children with ADHD Predominantly Inattentive Type who were excluded from analyses. Second, differential attrition may have somewhat biased estimates of OPP. Third, differences in predictive validity of early measures of behavior could be accounted for by differences in how these same measures given at Time 4 influenced clinician-based diagnoses. Finally, this study was not able to examine predictive power of teacher reports at age 4 and 5; teachers' reports may provide greater utility for older preschool-aged children.

Despite these limitations, this study provides information regarding the stability of preschool ADHD and ODD symptoms and points to assessment methods that may have utility in assessing preschool children who are at risk for ADHD or ODD/CD. Future research is needed to examine other risk factors, including familial variables that may be predictive of ODD/CD and may help in identifying children most in need of early intervention.

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Table 1

Logistic Regression Models Predicting Time 4 ADHD from Time 1 Variables (N = 162)

Predictors	M (SD)	Single predictor ^a b (SE)/OR	Model				
			DISC-IV only b (SE)	Mother b (SE)	Father b (SE)	Teacher b (SE)	Observer b (SE)
Intercept			−2.81 (.59)	−5.88 (1.24)	−2.85 (1.04)	−5.00 (1.35)	−3.10 (.65)
DISC-IV Hyperactivity	5.49 (2.04)	.44 (.10)/1.56***	.32 (.12)**	.21 (.13)	.31 (.12)*	.40 (.14)**	.31 (.12)*
Hyperactivity impairment	3.00 (2.34)	.35 (.08)/1.42***	.18 (.10)	.16 (.10)	.17 (.10)	.15 (.11)	.17 (.10)
DISC-IV Inattention	4.09 (2.57)	.21 (.07)/1.24**	−.04 (.10)	−.11(.11)	−.03 (.10)	−.14 (.12)	−.03 (.10)
Inattention impairment	2.54 (2.53)	.26 (.07)/1.3***	.13 (.10)	.11 (.11)	.13 (.10)	.20 (.12)	.12 (.10)
BASC Hyperactivity-mother	62.63 (12.55)	.08 (.02)/1.09***		.06 (.02)**			
BASC Attention-mother	58.06 (13.33)	.05 (.01)/1.05***		.01 (.02)			
BASC Hyperactivity-father	56.00 (16.33)	.03 (.02)/1.03 ^b			.01 (.02)		
BASC Attention-father	58.76 (15.61)	.02 (.02)/1.02			−.01 (.02)		
BASC Hyperactivity-teacher	52.48 (12.39)	.03 (.01)/1.03*				.06 (.04)	
BASC Attention-teacher	50.19 (14.86)	.02 (.02)/1.02				−.02 (.03)	
Observed activity/inattention	.41 (.25)	1.54 (.68)/4.69*					.91 (.75)
Likelihood ratio X ² c				11.30**	2.83	9.04*	1.72
Opp ^d (Kappa ^e)			.69 (.40)	.76 (.53)	.69 (.39)	.70 (.40)	.70 (.41)
OPP for boys/girls			.74/.68	.78/.73	.73/.71	.76/.72	.76/.68
Sensitivity			.62	.70	.63	.67	.67
Specificity			.74	.81	.73	.72	.73
PPP (cPPP ^f)			.64 (.38)	.73 (.53)	.64 (.37)	.64 (.37)	.65 (.38)
NPP (cNPP ^f)			.73 (.36)	.78 (.49)	.73 (.35)	.74 (.40)	.75 (.41)

* $p < .05$,** $p < .01$,*** $p < .001$ ^a Single predictor models were run for each predictor variable; logistic regression models were created in which each predictor was entered alone to predict ADHD.

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^b This coefficient was significant ($b = .04$, $SE = .02$, $p < .01$) when imputed data were excluded.

^c The likelihood ratio χ^2 was calculated by subtracting the deviance of the model from the deviance of the DISC-IV only model.

^d A cutoff of $1/(1+e^{-Z}) = .45$ was used.

^e Kappa was calculated to indicate the OPP correcting for chance prediction.

^f cPPP (corrected Positive Predictive Power) and cNPP (corrected Negative Predictive Power) were calculated to correct for chance (see Frick et al., 1994).

Note. OR = Odds Ratio; OPP = Overall Predictive Power; NPP = Negative Predictive Power; PPP = Positive Predictive Power; DISC-IV = Diagnostic Interview Schedule for Children; BASC = Behavior Assessment System for Children. The 6 children with ADHD Predominantly Inattentive Type at Time 4 were not included in these analyses. Because classification statistics (e.g., OPP) were not available using the MIANALYZE procedure, predictive power was calculated separately for each imputed data set and averaged across the five data sets.

Table 2
Logistic Regression Models Predicting Time 4 ODD/CD From Time 1 Variables (N = 168)

Predictors	<i>M (SD)</i>	Single predictor ^a <i>b (SE)/OR</i>	Model				
			DISC-IV Only <i>b (SE)</i>	Mother <i>b (SE)</i>	Father <i>b (SE)</i>	Teacher <i>b (SE)</i>	Observer <i>b (SE)</i>
Intercept			−1.75 (.45)	−3.56 (.84)	−3.26 (.83)	−3.90 (1.34)	−2.07 (.49)
DISC-IV ODD	4.59 (2.05)	.27 (.09)/1.31**	.32 (.10)**	.23 (.10)*	.28 (.11)*	.33 (.10)**	.30 (.10)**
ODD impairment	3.57 (2.53)	.05 (.06)/1.05	−.08 (.08)	−.10 (.08)	−.14 (.08)	−.11 (.08)	−.09 (.08)
BASC Aggression-mother	60.00 (13.27)	.05 (.01)/1.05***		.04 (.01)**			
BASC Aggression-father	57.02 (15.06)	.04 (.01)/1.04**			.03 (.02)*		
BASC Aggression-teacher	53.57 (12.00)	.04 (.02)/1.04 ^b				.04 (.02)	
Observed non-compliance, defiance, and negative affect	.33 (.26)	1.46 (.63)/4.30*					1.26 (.65)*
Likelihood ratio X ²				7.35**	7.24**	8.44**	3.88*
Opp ^c (Kappa)			.67 (.37)	.63 (.31)	.67 (.38)	.68 (.42)	.69 (.42)
OPP for boys/girls			.73/.69	.67/.62	.71/.66	.68/.66	.74/.65
Sensitivity			.58	.50	.54	.54	.59
Specificity			.72	.71	.74	.76	.75
ppp (cPPP) ^d			.55 (.28)	.50 (.20)	.55 (.29)	.57 (.32)	.58 (.33)
NPP (cNPP) ^d			.75 (.31)	.71 (.20)	.74 (.28)	.74 (.29)	.76 (.34)

* $p < .05$,

** $p < .01$,

*** $p < .001$

Note. OPP = Overall Predictive Power; NPP = Negative Predictive Power; PPP = Positive Predictive Power; DISC-IV = Diagnostic Interview Schedule for Children; BASC = Behavior Assessment System for Children

^a Single predictor models were run for each predictor variable; logistic regression models were created in which each predictor was entered alone to predict ODD/CD.

^b This coefficient was significant ($b = .05$, $SE = .02$, $p < .05$) when imputed data were excluded.

^c A cutoff of $1/(1+e^{-Z}) = .41$ was used.

^d cPPP (corrected Positive Predictive Power) and cNPP (corrected Negative Predictive Power) were calculated to correct for chance (see Frick et al., 1994).

Table 3

Overall Predictive Power of Time 2 and 3 ADHD and ODD/CD Models

	Time 2		Time 3	
	OPP	Kappa	OPP	Kappa
<u>ADHD</u>				
DISC-IV only	.77	.55	.80	.60
DISC-IV plus mother	.79	.60	.80	.60
DISC-IV plus father	.77	.55	.80 ^a	.62
<u>ODD/CD</u>				
DISC-IV only	.65	.36	.70	.44
DISC-IV plus mother	.66	.37	.73	.49
DISC-IV plus father	.69	.43	.76 ^b	.56

Note. OPP = Overall Predictive Power; DISC-IV = Diagnostic Interview Schedule for Children

^a OPP was .87 when analyses were conducted without imputed data.

^b OPP was .83 when analyses were conducted without imputed data.