

Parent and Teacher Ratings of Attention-Deficit/Hyperactivity Disorder in Preschool: The ADHD Rating Scale-IV Preschool Version

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McGoey, K.E., DuPaul, G.J., Haley, E., & Shelton, T.L. (2007). Parent and teacher ratings of Attention-deficit/hyperactivity disorder in preschool: The ADHD Rating Scale-IV Preschool Version. *Journal of Psychopathology and Behavioral Assessment*, 29, 269-276. doi:10.1007/s10862-007-9048-y

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Abstract:

Efforts for early identification and intervention for children with AD/HD have necessitated the development of rating scales of behavior for the preschool population. The standardization, reliability, and validity data were presented for the ADHD Rating Scale-IV Preschool Version. Parent and teacher ratings were collected on 902 and 977 children 3 to 5 years of age, respectively. Raw scores for the Inattention, Hyperactivity/Impulsivity and Total scores were converted to T-Scores and percentile ranks. Reliability coefficients ranged from 0.80 to 0.95 indicating good test-retest reliability. Concurrent validity with the Conners Teacher Rating Scales: Revised-Short and Conners Parent Rating Scale: Revised-Short ranged from 0.54 to 0.96. The ADHD-Rating Scale-IV appears to be a reliable, valid and user friendly measure for screening preschoolers with behavior problems. Future research is needed to validate its widespread use as a screening and diagnostic tool.

Article:

Attention-Deficit/Hyperactivity Disorder (AD/HD) involves the occurrence of inappropriate levels of inattention, hyperactivity and impulsivity (Barkley 1998). Children with AD/HD have considerable difficulty regulating their behavior in response to situational demands. These difficulties often result in problems with behavior regulation, academic achievement, peer and familial relations. Children are diagnosed at a rate of 4 to 6% in the school age population (Barkley 1998) and 2% in the preschool population (Lavigne et al. 1996). Behaviors associated with AD/HD in the preschool population often result in expulsion from preschool or childcare settings (Blackman et al. 1991). For example, a child of preschool age at risk for AD/HD may change activities often in the classroom, may not complete tasks, may experience many sudden mood changes and temper tantrums, and may lack friends because of aggressive behavior and inability to cooperate in play (Campbell 2002; DuPaul et al. 2001).

Longitudinal investigations of the stability of problem behavior have yielded compelling evidence for the early identification and intervention of problem behavior. For example, Pierce et al. (1999) followed hard-to-manage preschool children into early elementary school and middle school. Findings indicate that preschoolers with high levels of hyperactivity and aggression who continued with patterns of problem behaviors at-school entry and early elementary school were more likely than control children to meet criteria for an externalizing diagnosis in middle childhood. At elementary age, children with AD/HD are at-risk for developing Oppositional Defiant Disorder, Conduct Disorder, criminal behavior, poor social status, poor academic achievement and poor familial relations. Given the relative stability of problem behaviors, the debilitating effects of the disruptive behavior and the risk of developing more severe disruptive behavior, early identification and comprehensive intervention to ameliorate problem behaviors are imperative.

The first step within a comprehensive intervention model is effective assessment of problem behavior. The recommended procedures for assessment of AD/HD include behavioral observations, completion of rating scales of behavior across at least two settings, parent and teacher interviews, and review of information to rule out the presence of other developmental disorders (Barkley 1998). The diagnosis of AD/HD in a child 3 to 6 years of age is extremely difficult (McGoey et al. 2006). During the preschool years, development occurs at a rapid pace. A number of behaviors associated with AD/HD occur frequently among children of preschool age including hyperactivity, inattention, impulsivity, carelessness, disorganization, and aggression. As a result, before a diagnosis of AD/HD may be rendered appropriately in young children, the severity and pervasiveness of problem behaviors must be assessed by comparison with typical developmental expectations for children of preschool age.

To date, there are few measures available to assess the risk for AD/HD in young children. Of the measures available, many are not developmentally appropriate, rely on small standardization samples and report insufficient details about the reliability and validity for the preschool age group (Byrne et al. 1998; Sciutto and Terjesen 2000). Thus, assessments of children of preschool age referred for attention and activity problems must rely on inadequate measures or descriptive analyses of the results obtained.

The purpose of the present study was to develop a psychometrically sound, developmentally appropriate screening instrument for the symptoms of AD/HD in the preschool population. Standardization data were collected across a national sample of preschool children stratified by age, gender, socioeconomic status and ethnicity according to the results of the 2000 census report. The reliability and validity of the rating scale also were tested.

MATERIALS AND METHODS

Participants

Parent ratings were collected on 902 children, 479 boys and 423 girls, 3 years, 0 months to 5 years, 11 months of age ($M = 3.80$ $SD = 0.66$). The sample consisted of 53% boys and 47% girls. Fifty-three percent of the children were 4 years of age, 33% were 3 years and 13% were 5 years of age. The majority of participants were Caucasian (44%) with ratings also collected on African Americans (37%), Hispanic Americans (3.6%), Asian Americans (6.5%), and children of other ethnicities (4.5%), with 4% of the sample not reporting ethnicity. Parent respondents were

predominantly mothers (87%), with 7% fathers, 4% other (e.g., grandparent, guardian) and 3% not reporting relationship completing the ratings. In terms of parent ethnicity, 44% of the respondents were Caucasian, 37% were African American, 3% were Hispanic-American, 7% were Asian-American, 5% were listed as other and 4% did not respond. The socioeconomic status of families was calculated when necessary information was provided using the Hollingshead Four Factor Index of Social Status (Hollingshead 1975). The Hollingshead Index of the participants completing the necessary information ranged from 20 to 66 (8 to 22 = 1.5%; 23 to 44 = 17.6%; 45 to 66 = 80.5%), with a median of 53.00 ($M = 52.15$, $SD = 10.89$). All parents gave informed consent to participate in the study.

Teacher data were collected on 977 children, 500 boys and 477 girls, 3 years, 0 months to 5 years 11 months of age ($M = 3.84$ $SD = 0.64$). The participants were 51% boys and 49% girls. Fifty-seven percent of the children were 4 years of age, 30% were three and 14% were 5 years of age. Child ethnicity as rated by the teachers was Caucasian 14.1%, African American 2%, Hispanic American 5.7%, Asian American 17.8%, other 2.4% and not indicated 58%. In terms of teacher ethnicity, 34% of the respondents were Caucasian, 3% were African American, 2% were Hispanic-American, 0.5% were Asian-American, 1% was listed as other, and 60% of the teachers did not indicate their ethnicity. Years of teaching experience ranged from 1 to 46 years ($M = 11.58$, $SD = 8.06$). The teachers were predominantly teaching in general education preschool settings (95.7%). All teachers signed consent forms to participate in the study.

To match the sample according to the population of the four regions of the United States (e.g. West, Northeast, South and Midwest) in the 2000 census, a weighting procedure was used to derive population inferences from the data with low levels of bias and sampling error (Rust and Johnson 1992). This procedure allows the sample size to remain intact while matching the population to the demographics of the United States. Participants' scores on the ADHD-Rating Scale IV Preschool Version were weighted using the Midwest sample as the guide. After the weighting procedure was completed the sample was representative of the census based on the percent of population from each region.

Test-Retest Reliability and Concurrent Validity. A convenience subsample of 42 parents and 41 teachers from the original sample completed the ADHD Rating Scale-IV Preschool Version after a 4-week interval. In addition, 76 parents and 68 teachers from a sample of convenience completed the ADHD Rating Scale IV Preschool Version and the Conners Teacher or Parent Rating Scale—Revised (Conners 1997). Return rate for the reliability and validity sample was 100%.

Measures

ADHD Rating Scale-IV Preschool Version. This scale is a modified version of the ADHD Rating Scale-IV (DuPaul et al. 1998a). It is an 18-item questionnaire that requires the respondent to rate the frequency of occurrence of ADHD symptoms as defined by the DSM-IV-TR (American Psychiatric Association 2000). Examples appropriate for the developmental level of preschool children were added to the scale and reviewed by a panel of experts in early childhood development and assessment of preschool children, preschool teachers, and parents of preschool children. After expert review the scales examples were modified according to recommendations, and then pilot tested for readability and clarity in a clinic designed to assess behavior problems in

preschool children. No problems were indicated during pilot testing. See Appendix. The respondent rates each item on a Likert scale of 0 (not at all) to 3 (very often). The scale yields scores for an Inattentive, Hyperactive/Impulsive and Total Scale.

The reliability and validity of the ADHD Rating Scale-IV was shown to be adequate with a school age population (DuPaul et al. 1998b). Test–retest reliability for the parent and teacher scales over a 4-week interval ranged from correlation coefficients of 0.78 to 0.90. An assessment of the internal consistency of parent and teacher scales yielded coefficient alphas of 0.86 to 0.96. The Pearson Product moment correlations between the ADHD-IV School Version and criterion measures (e.g., Conners Teacher Rating Scales) ranged from 0.22 to 0.88. Twenty-eight of the 30 scales compared achieved statistical significance. The Pearson Product moment correlations for the ADHD-IV Parent Version and criterion measures (e.g., Conners Parent Rating Scales) ranged 0.10 to 0.81. Fifteen of the 18 scales compared achieved statistical significance. Thus, test–retest reliability and concurrent validity of the ADHD Rating Scale-IV for children of elementary age are considered adequate.

Conners Rating Scales—Revised (Conners 1997). The short forms of the parent (CPRS-R:S) and teacher (CTRS-R:S) scales were used. The CPRS-R:S has 27 items that require the parent to rate the accuracy and severity of each behavior. Likewise, the CTRS-R:S has 28 items that require the teacher to rate the accuracy and severity of each item. The respondent rates each item on a Likert scale of 0 (not true at all) to 3 (very much true). Internal consistency coefficients range from 0.83 to 0.93 for the preschool sample. Test–retest reliability range from 0.62 to 0.85. Results of intercorrelations between subscales ranged from 0.48 to 0.87 (Conners 1997). Thus, test–retest reliability and concurrent validity of the CPRS-R:S and CTRS-R:S are considered good.

Descriptive or Demographic Data. Teachers were asked to provide information regarding their gender, ethnic group, number of years of teaching experience, type of classroom, and grade level taught. Parents were asked to provide information regarding their highest level of education; current occupation; marital status and gender; their child’s age, gender and ethnic group.

Procedures

First, permission was gained to conduct the study from the institutional review boards of all participating universities. Childcare centers in each of the four regions of the United States were then contacted for possible participation based on the demographics (e.g. SES, ethnicity) of the attending families. Participating states chosen by convenience included Massachusetts, Pennsylvania, New Jersey, South Carolina, Florida, Wisconsin, and Oregon. Every attempt was made to choose equally from low, middle, and high income areas and to contact centers serving diverse populations. Once directors gave permission for the center to participate, individual teachers were contacted and times were scheduled to distribute the packet to the parents and teachers. Packets consisted of a permission slip, demographic cover page, the ADHD Rating Scale-IV Preschool Version, and the CTRS-R:S or CPRS-R:S when applicable.

Parent Version. Ratings of behavior on the ADHD-Rating Scale-IV Preschool—Home Version were collected on children aged 3 to 5 years. An investigator distributed and collected the completed rating scales from the parents at the preschool during child drop-off and pick-up

periods. Some parents completed the materials at home and returned them to the child's teacher. A total of 1,705 parent packets were distributed in the South, Northeast, and Midwest regions and 850 were returned for a return rate of 50%. Fifty-seven parent questionnaires were collected in the West sample. The return rate for each region was consistent except for the Northeast sample where 100% of the questionnaires were returned. No differences were found in the Northeast sample compared to the other samples. The number of questionnaires distributed in West was not collected therefore the percentage of questionnaires returned is not available. There is no indication that the return rate would differ in this region.

Teacher Version. Ratings of behavior on the ADHD-Rating Scale-IV Preschool Version were collected on students aged 3 to 5 years. Head teachers completed two to six rating scales on boys and girls chosen randomly by the investigator from the class roster (e.g. 2nd, 4th, and 6th boy and 3rd, 5th and 7th girl). A total of 1,100 packets were distributed in the South, Northeast, and Midwest regions and 986 returned indicating a return rate of 81%. The return rate for each region was consistent except for the Northeast sample where 100% of the questionnaires were returned. No differences were found in the Northeast sample compared to the other samples. Ninety-five teacher questionnaires were returned in the West sample. The number of questionnaires distributed in the West was not recorded; therefore the percentage of questionnaires returned is not available. There is no indication that the return rate would differ in this population.

RESULTS

Sex, Age, and Ethnic Group Differences

To further analyze the ADHD Rating Scale-IV Preschool Version, subscale and total scores were computed for the Inattention Factor (IA; sum of scores on odd-numbered items), Hyperactive/Impulsive Factor (HI; sum of scores on the even-numbered items), and Total Score (sum of all items). A 2 (sex) \times 3 (age) \times 2 (ethnic group) multivariate analysis of variance (MANOVA) was conducted using the two subscales of the ADHD Rating Scale-IV Preschool Home and School Version as the dependent variables. The Hispanic, Asian, and Other categories of ethnic groups were dropped from analysis due to small sample size.

A statistically significant result was found for the main effects of child ethnicity on the Inattention Subscale of the School Version (Wilk's $\lambda = 0.04$), $F(4,69.17) = 3.10$, $p < 0.05$, however, the variance accounted for by this effect was 0.032. Given the large sample size and small variance, this effect has limited clinical significance. Therefore, the ethnicity difference was viewed as uninterpretable. No statistically significant interactions or main effects were found for sex, or age.

Standardization Data. The Inattention, Hyperactivity/Impulsivity and Total Scores were calculated and transformed to T-scores for each participant. Means, Standard Deviations and four cut-off points of 80th, 90th, 93rd, and 98th percentiles were calculated separately for boys and girls on both the AD/HD-IV Rating Scale Preschool School Version and Home Version (see Tables 1, 2, 3, 4, 5 and 6). The decision to use the above cut-off points and provide gender based norms is supported by current rating scales of behavior including the ADHD Rating Scale-IV.

Table 1: Normative data for preschool boys on the ADHD-IV rating scale preschool—school version ($n = 500$)

Factor	Mean (SD)	Raw score	T-Score	Percentile
Inattention	6.74 (6.66)	12	62	80
		17	71	90
		18	74	93
		24	83	98
Hyperactivity/impulsivity	7.23 (7.30)	12	61	80
		19	74	90
		22	77	93
		25.5	83	98
Total score	13.90 (13.29)	25	63	80
		35	72	90
		38	75	93
		49	84	98

Table 2: Normative data for preschool girls on the ADHD-IV rating scale preschool—school version ($n = 477$)

Factor	Mean (SD)	Raw score	T-Score	Percentile
Inattention	3.63 (4.74)	6	52	80
		9	57	90
		11	61	93
		20	76	98
Hyperactivity/impulsivity	4.01 (5.12)	6	51	80
		11	59	90
		13	63	93
		19	71	98
Total score	7.57 (9.33)	13	53	80
		19	59	90
		24	62	93
		35	72	98

Table 3: Normative data for preschool children on the ADHD-IV rating scale preschool—school version ($n = 977$)

Factor	Mean (SD)	Raw Score	T-Score	Percentile
Inattention	5.24 (6.02)	8.5	57	80
		13	64	90
		16	69	93
		23	82	98
Hyperactivity/impulsivity	5.67 (6.51)	9	56	80
		16	68	90
		18	71	93
		24	81	98
Total score	10.85 (11.97)	18	57	80
		29	67	90
		33	71	93
		44	80	98

Table 4: Normative data for preschool boys on the ADHD-IV rating scale preschool—home version ($n = 479$)

Factor	Mean (SD)	Raw score	T-Score	Percentile
Inattention	6.64 (4.76)	9	57	80
		12.5	63	90
		14	67	93
		20	79	98
Hyperactivity/impulsivity	8.19 (5.35)	12.5	59	80
		16	66	90
		17	68	93
		21	75	98
		22	58	80
Total Score	14.86 (9.58)	28	64	90
		32	69	93
		40	78	98

Table 5: Normative data for preschool girls on the ADHD-IV rating scale preschool—home version ($n = 423$)

Factor	Mean (SD)	Raw Score	T-Score	Percentile
Inattention	5.31 (4.48)	8	53	80
		10	58	90
		12	62	93
		18	75	98
Hyperactivity/impulsivity	6.56 (4.75)	9	53	80
		11	58	90
		14	62	93
		21	75	98
		16	52	80
Total score	11.90 (8.73)	21	58	90
		24	61	93
		40	78	98

Table 6: Normative data for preschool children on the ADHD-IV rating scale preschool—home version ($n = 907$)

Factor	Mean (SD)	Raw score	T-Score	Percentile
Inattention	6.00 (4.67)	9	56	80
		11	60	90
		13	64	93
		20	79	98
Hyperactivity/impulsivity	7.40 (5.14)	10.5	55	80
		14	62	90
		16	66	93
		21	75	98
		19	56	80
Total score	13.43 (9.29)	25	62	90
		28	65	93
		40	78	98

Internal Consistency. Coefficient alphas were calculated to determine the internal consistency of the ADHD Rating Scale-IV Preschool School Version and its two subscales. The following alphas were obtained: Total Score 0.95, Inattention 0.93 and Impulsivity/Hyperactivity 0.92. Coefficient alphas were also calculated to test the internal consistency of the ADHD Rating Scale IV Preschool Home Version. Results indicated the coefficient alphas to be 0.92 for the Total Score, 0.88 for the Inattention subscale, and 0.85 for the Hyperactivity/Impulsivity subscale.

Test–Retest Reliability. Test–retest reliability data were obtained for both versions 4 weeks apart. The Pearson Product moment correlations for the teacher version were 0.93, 0.96, and 0.94 for the Inattention, Hyperactivity/Impulsivity and Total scores, respectively. Correlations for the parent version were 0.85, 0.80 and 0.87 for the Inattention, Hyperactivity/Impulsivity, and Total score, respectively.

Validity. Pearson product-moment correlations for the ADHD Rating Scale IV Preschool Version and the CTRS-R are presented in Table 7. The values ranged from 0.54 to 0.96 with all achieving statistical significance. The strongest correlations were found between the CTRS Hyperactivity and the Inattention (0.85), Hyperactivity/Impulsivity (0.96), and Total (0.95) Scales of the ADHD-Rating Scale IV-Preschool School Version, and the CTRS-R ADHD Index and the Inattention(0.87), Hyperactivity/Impulsivity(0.92), and Total (0.94) Scales of the ADHD-Rating Scale IV Preschool Version. Pearson product-moment correlations for the ADHD Rating Scale IV Preschool Home Version and the CPRS-R are presented in Table 8. Values ranged from 0.55 to 0.87. Like the school version, the strongest correlations were found between the CPRS Hyperactivity and the Hyperactivity/Impulsivity (0.80), and Total (0.83) Scales of the ADHD-Rating Scale IV Preschool Home Version, and ADHD Index and the Inattention(0.85), Hyperactivity/Impulsivity (0.80), and Total (0.87) Scales of the ADHD-Rating Scale IV Preschool Home Version.

Table 7: Validity coefficients for the ADHD rating scale IV preschool version and the conners teacher rating scale—revised ($n = 68$)

Measure	Inattention	Hyperactivity/impulsivity	Total
CTRS-R Oppositional	0.54*	0.64*	0.63*
CTRS-R Cognitive Problems/inattention	0.75*	0.64*	0.71*
CTRS-R Hyperactivity	0.85*	0.96*	0.95*
CTRS-R ADHD Index	0.87*	0.92*	0.94*

*Correlation is significant at the 0.05 alpha level.

Table 8: Validity coefficients for the ADHD rating scale IV preschool home version and the conners parent rating scale—revised ($n = 76$)

Measure	Inattention	Hyperactivity/impulsivity	Total
CPRS-R Oppositional	0.55*	0.63*	0.63*
CPRS-R Cognitive Problems/Inattention	0.75*	0.59*	0.71*
CPRS-R Hyperactivity	0.77*	0.80*	0.83*
CPRS-R ADHD Index	0.85*	0.80*	0.87*

*Correlation is significant at the 0.05 alpha level.

DISCUSSION

Standardization, reliability, and validity data were presented for the ADHD Rating Scale-IV Preschool Version. Parent and teacher ratings were collected on 907 and 993 children 3 to 5 years of age, respectively. Raw scores for the Inattention, Hyperactivity/Impulsivity and Total scores were converted to T-Scores and percentile ranks. There were no statistically significant main or interaction effects found for age and sex; however, according to the raw score means, boys and girls may present as clinically different with boys exhibiting more inattention and hyperactivity/impulsivity characteristics. There was a statistically significant main effect for child ethnicity on the Inattention Subscale; however, the small variance renders the effect clinically nonsignificant and meaningless given the sample size and nature of the construct of inattention.

Reliability coefficients ranged from 0.80 to 0.95 indicating good test–retest reliability. Test–retest reliability for the parent version was lower possibly due to inconsistent child behavior and parent perception. Concurrent validity with the CTRS:R-S and CPRS:R-S ranged from 0.54 to 0.96. Strongest correlations were found between the Hyperactivity and ADHD Index of the Conners Rating Scales and the scales of the ADHD-Rating Scale IV Preschool Version. Miller et al. (1997) reported the CTRS:R to have good internal reliability and utility for evaluating preschool children with AD/HD. Therefore, the strong correlation between the two scales promotes the validity of the ADHD Rating Scale-IV Preschool Version. However, the ADHD-Rating Scale-IV Preschool Version provides clinicians with a scale adapted specifically for preschool age children, with developmentally appropriate examples of the specific DSM-IV criteria for AD/HD. In addition, the time needed to complete the scale is minimal making the scale appropriate as a screening measure or for progress monitoring of interventions. The reliability and validity of the ADHD Rating Scale-IV Preschool Version is comparable to the reliability and validity of the Conners Rating Scales with the test–retest reliability coefficients for the ADHD Rating Scale-IV Preschool stronger than the Conners Rating Scales. In addition, the reliability and validity of the preschool version is comparable to the ADHD Rating Scale-IV developed for school-age children (DuPaul et al. 1998b). Thus, the two scales can be combined to provide continuous assessment or progress monitoring of ADHD symptoms from age 3 to 18 years, adding valuable information to a comprehensive, multi-method assessment of AD/HD.

Furthermore, the AD/HD Rating Scale-IV Preschool Version provides a valuable resource in the assessment of preschool children with AD/HD. The standardization sample represents a large national sample of preschool children from different socioeconomic status and ethnicities. Previous scales provide a restrictive sample due to small sample size of the preschool age group (e.g. Conners Teacher and Parent Rating Scales; Conners 1997) or disproportionate samples from geographic regions (e.g. Preschool and Kindergarten Behavior Scales, Merrell 2003). Because the ADHD Rating Scale-IV Preschool Version provides age-appropriate examples for the DSM-IV criteria for AD/HD it is more developmentally appropriate than previous scales used for the preschool population. The age appropriate examples allow parents and preschool teachers to better understand the behavior in question (e.g. often forgets things) avoiding the common occurrence in clinical practice of incomplete scales and frustration during completion. In addition, the scale does not ask teachers or parents about academic related behaviors that are difficult to assess in the preschool population. Therefore, the AD/HD Rating Scale-IV Preschool

Version provides clinicians with a reliable, valid, and developmentally appropriate screening measure of AD/HD symptoms in the preschool population.

Potential limitations should be taken into consideration when using this scale. First, the return rate from parents asked to complete the scale was low. This may introduce a bias in the ratings. The results are consistent with previous investigations including the school age sample of the ADHD Rating Scale-IV. Second, while every attempt was made to stratify the sample according to the 2000 United States census, the sample does not match the current geographic, ethnic, or socioeconomic composition of the United States. To conform to the geographic representation of the United States, a weighting procedure was applied to generate the standardization data, thus, creating a representative sample. However, the weighting procedure could only be applied to one variable and thus, the sample is still not representative of the socioeconomic status of the United States. Generalization of the standardization data to lower socioeconomic groups should be made with caution. Third, this study included only children attending preschool or childcare. Future investigations should not neglect children at home or in home care centers. Fourth, a limited sample of 5 year olds was obtained given that most 5 year olds are attending kindergarten and not preschool. In addition, the parent ratings are representative of mother ratings and father's ratings should be interpreted with caution and further researched.

Future research should explore the effect of ethnicity, disability and gender on teacher and parent ratings. Further studies on the discriminant validity and clinical utility of the scale are warranted. In addition, it is recommended that the factor structure of the ADHD Rating Scale-IV Preschool Version be computed and compared to the ADHD Rating Scale-IV.

In conclusion, this preliminary investigation found the ADHD-IV Rating Scale-Preschool Version to be a reliable and valid scale. The scale appears to be a viable option as a screening measure to determine need for further assessment or as part of a comprehensive, multi-method assessment of preschoolers with ADHD.

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