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ABSTRACT

Numerous studies have provided empirical support for subtyping attention deficit/hyperactivity disorder (ADHD) along two primary dimensions: inattention and hyperactivity-impulsivity. Efforts to further specify subtype differences in the functional impairments of children with ADHD are presented in this paper. It was predicted that differences regarding academic and social functioning would resemble those found in the Diagnostic and Statistical Manual, 4th ed. (DSM-IV) field trials. The present study tested 125 children (99 boys, 26 girls, ages 7 to 12), who met DSM-IV criteria for two subtypes of ADHD (ADHD Combined Hyperactivity and Impulsivity, and ADHD Predominantly Inattentive) and who had not received psychoactive medication for at least 3 months. Differences between children in the two subgroups were most apparent regarding disruptive and noncompliant behaviors. Mild group differences were found regarding functional impairments in social functioning, suggesting that children with hyperactivity and impulsivity, in addition to inattention, may be at greater risk for peer-interpersonal impairment in school settings. The lack of significant differences as regards academic functioning and internalizing symptoms suggest that children belonging to the ADHD Combined and the ADHD Impulsive subtypes may be more similar in this respect than previously thought. (RJM)

FUNCTIONAL IMPAIRMENTS ASSOCIATED WITH AD/HD: COMPARISON BY SUBTYPES

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INTRODUCTION

The manner in which the core components of AD/HD should best be categorized has been the subject of significant controversy for many years. A number of factor analytic studies (e.g., Lahey et al., 1988) provided empirical support for subtyping AD/HD along two primary dimensions: inattention and hyperactivity-impulsivity. These findings contributed to the reintroduction of subtypes in the DSM-IV, designated as the Combined (AD/HD-COM), Predominantly Inattentive (AD/HD-I), and Predominantly Hyperactive-Impulsive (AD/HD-HI) types.

The DSM-IV field trials for AD/HD (Lahey et al., 1994) suggested that *functional impairments* associated with AD/HD may differ according to subtype. For instance, teacher ratings of academic performance were lower, and parent ratings of homework problems were higher for children in the AD/HD-COM and AD/HD-I groups than for those in the AD/HD-HI group. In addition, children with AD/HD-I had more peer problems than those in the COM and HI groups.

The present study sought to further specify subtype differences in the functional impairments of children with AD/HD. It was predicted that differences regarding academic and social functioning would resemble those found in the DSM-IV field trials. In addition, we hypothesized that children with AD/HD-I would manifest a greater degree of anxiety relative to children with AD/HD-COM. Consistent with previous studies (e.g., Barkley et al., 1990), it was also predicted that children with AD/HD-COM would have more externalizing problems. Children with AD/HD-HI were not expected to present in sufficient numbers for the purposes of subtype comparisons.

METHODS

PARTICIPANTS. The sample included 125 children drawn from the outpatient clinic of a university-based hospital in a large metropolitan area, aged 7 to 12 years, meeting DSM-IV criteria for AD/HD-COM (n = 83) or AD/HD-I (n = 42), who had not received psychoactive medication for a period of at least 3 months. There were 99 boys and 26 girls. All participants had also received both parent *and* teacher ratings of significant AD/HD symptoms on the *Child Behavior Checklist* (CBCL & TRF). Exclusionary criteria included evidence of overt neurological disorder, PDD, or psychosis, as well as Composite IQ below 80.

MEASURES. AD/HD. AD/HD diagnoses were determined via structured parent interview (DICA-R-P). Participants were assigned to an AD/HD subtype based upon parent (DICA-R-P) and teacher report (the Inattention and Overactivity factors of the *Child Attention Profile*).

Externalizing problems were assessed using the CBCL and TRF Externalizing factors.

Internalizing symptoms. Anxiety symptoms were assessed using the Anxiety subscale of the *Devereux Scales of Mental Disorders* (DSMD), Parent Form, and the Worry/Oversensitivity subscale of the *Revised Children's Manifest Anxiety Scale* (RCMAS). Depression symptoms were assessed using the DSMD Depression subscale, as well as the Anhedonia subscale of the *Children's Depression Inventory* (CDI).

Academic functioning was measured with the following: 1) The Mathematics and 2) Reading subtests of the *Kaufman Test of Educational Achievement* (K-TEA), Brief Form; 3) *Homework Problems Checklist* (HPC); and 4) Academic Performance factor of the *Academic Performance Rating Scale* (APRS).

Social functioning was measured with the following: 1) CBCL and 2) TRF Social Problems factors; and 3) CBCL Social Competence factor.

DATA ANALYSIS

Differences between the AD/HD-COM and AD/HD-I groups were examined using a MANCOVA with measures of academic functioning as the dependent variables. Composite IQs from the Kaufman Brief Test of Intelligence (K-BIT) were used as the covariate.

Separate MANOVAs were performed for social functioning, externalizing problems, and internalizing symptoms in the comparison of the AD/HD-COM and AD/HD-I groups.

RESULTS

Means and standard deviations for the dependent variable measures and IQ are presented in Tables 1 through 3. As shown, children in the AD/HD-COM group were rated overall by parents and teachers as displaying significantly elevated externalizing problems and social problems, by parents as having significant homework problems and poor social competence, and by teachers as displaying significant academic productivity deficits.

Children in the AD/HD-I group also received high mean ratings of homework problems and teacher ratings suggestive of academic productivity deficits, as well as significantly elevated parent ratings of social problems. On the other hand, children with AD/HD-I were rated in the overall normal range by parents and teachers for externalizing problems, by teachers for social problems, and by parents for social competence.

Mean scores for children in both groups were in the average range regarding Composite IQ, Reading, and Mathematics. Mean scores for both groups were in the normal range for both parent- and self-report of anxiety *and* depression.

Multivariate analysis of variance test results are outlined in Table 4.

Consistent with findings from the DSM-IV field trials, there were no group differences regarding academic functioning.

The MANOVA for social functioning indicated that children in the AD/HD-COM group were rated as displaying more social problems than children in the AD/HD-I group. Roy-Bargmann stepdown analysis indicated that the differences were largely accounted for by TRF Social Problems scores (Table 5).

As expected, children in the AD/HD-COM group received higher ratings for externalizing problems. As noted in Table 6, this was true both for parent (CBCL) and teacher report (TRF).

In contrast with several earlier studies that suggested a relationship between internalizing problems and ADD without Hyperactivity (e.g., Lahey et al., 1984; Barkley et al., 1990), the present study did not find differences between the AD/HD-COM and AD/HD-I groups regarding either anxiety or depression (Table 4).

DISCUSSION

Differences between children in the AD/HD-COM and AD/HD-I groups were *most* apparent regarding disruptive and noncompliant (i.e., externalizing) behaviors. The mild group differences found regarding functional impairments in social functioning should not be overinterpreted, although they suggest that children with hyperactivity and impulsivity in addition to inattention may be at greater risk for peer-interpersonal impairment in school settings.

The lack of significant differences found pertaining to academic functioning and internalizing symptoms suggest that children belonging to the AD/HD-COM and AD/HD-I subtypes may be more similar in these areas than previous research might indicate.

Intervention programming for children with AD/HD-COM, then, would appear to be optimally designed when targets include the child's functional impairments in compliance and disruptive behaviors, as well as in school peer problems. The present study also suggests that problems related to anxiety and depression may not be more salient among many children with AD/HD than among the general population of elementary school children.

In general the results of this study are supportive of diagnostic subtyping regarding AD/HD, although differences in functional impairments were not as apparent and

meaningful as research using previous DSM criteria would suggest.

In future research group comparisons including children in the AD/HD-HI group will help to further delineate the functional significance of subtyping children with AD/HD using DSM-IV criteria.

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Table 1

Descriptive Statistics for Academic Functioning and IQ ($N = 125$)

	AD/HD Subtype	
Variable	**AD/HD-COM ($n = 83$)**	**AD/HD-I ($n = 42$)**
K-BIT Composite IQ *M (SD)*	100.81 (11.30)	100.05 (11.84)
Homework Problems Checklist[a] *M (SD)*	34.04 (11.02)	29.34 (11.47)
APRS Academic Performance[b] *M (SD)*	23.95 (6.39)	23.73 (6.95)
K-TEA Reading SS *M (SD)*	100.58 (13.62)	102.29 (13.89)
K-TEA Mathematics SS *M (SD)*	98.90 (14.47)	99.24 (15.08)

[a] Raw Scores used (possible range: 0-60), and were roughly normally distributed. Mean raw score for the standardization sample of children grades 2-4 was 10.50 (*SD* = 8.03). Higher scores indicate more problems.

[b] Raw Scores used (possible range: 9-45), and were roughly normally distributed. Raw score means for the standardization sample of children grades 1-6 ranged from 42.40 to 48.77 (*SD* range: 7.82 to 12.47). Lower scores indicate lesser performance.

Table 2

Descriptive Statistics for Social Functioning

	AD/HD Subtype	
Variable	**AD/HD-COM**	**AD/HD-I**
CBCL Social Problems *M (SD)*	63.28 (10.44)	64.00 (10.31)
TRF Social Problems *M (SD)*	62.87 (7.74)	59.10 (6.90)
CBCL Social Competence *M (SD)*	38.42 (9.05)	41.14 (8.38)

Note. *T*-scores used. For CBCL and TRF Social Problems scores, higher scores reflect greater severity of problems. For CBCL Social Competence scores, lower scores reflect poorer competence.

Table 3

Descriptive Statistics for Externalizing & Internalizing Problems

	AD/HD Subtype	
Variable	**AD/HD-COM**	**AD/HD-I**
CBCL Externalizing *M (SD)*	64.25 (9.13)	57.05 (11.48)
TRF Externalizing *M (SD)*	65.35 (8.04)	54.50 (6.90)
DSMD Anxiety *M (SD)*	56.29 (11.67)	52.55 (8.78)
RCMAS Worry/Oversensitivity[a] *M (SD)*	10.12 (3.36)	9.55 (3.58)
DSMD Depression *M (SD)*	59.01 (12.45)	56.12 (12.64)
CDI Anhedonia *M (SD)*	54.95 (12.82)	51.24 (10.42)

[a] Scaled scores used ($M = 10$ and $SD = 3$). *T*-scores used for other measures in this table.

Table 4

MANCOVA/MANOVA Results Comparing AD/HD-COM and AD/HD-I Groups

Dependent Variable Domain	Value[a]	*df*	*F*	*p*
Academic Functioning	.06	4, 120	1.72	.151
Social Functioning	.09	3, 121	4.09	.008
Externalizing	.34	2, 122	31.31	< .001
Internalizing	.04	4, 120	1.22	.306

[a] All multivariate test values reflect Pillai Trace statistics.

Table 5

Roy-Bargmann Stepdown Analyses for Social Functioning

Variable	Mean Square Errors	*df*	*F*	*p*
TRF Social Problems	55.85	1, 123	7.11	.009
CBCL Social Competence	78.65	1, 122	2.46	.119
CBCL Social Problems	92.59	1, 121	2.50	.117

Table 6

Roy-Bargmann Stepdown Analyses for Externalizing Problems

Variable	Mean Square Errors	*df*	*F*	*p*
CBCL Externalizing	99.53	1, 123	14.55	< .001
TRF Externalizing	58.15	1, 122	43.09	.< .001

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