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# THE EFFECT OF COMORBID AD/HD AND LEARNING DISABILITIES ON PARENT-REPORTED BEHAVIORAL AND ACADEMIC OUTCOMES OF CHILDREN

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**Abstract.** Data from the 2001 National Household Education Survey were examined to estimate the prevalence of comorbid AD/HD and LD among school-aged children in the United States and assess how this comorbidity was associated with selected parent-reported behavioral and academic outcomes. The observed prevalence of comorbidity coincided with estimates in previous studies. Parents of children with comorbid AD/HD + LD were significantly more likely than parents of children with LD-only to be contacted by teachers about behavioral problems at school. Additionally, students with comorbid disorders were more likely than students with AD/HD-only to show impaired academic outcomes. However, when compared to children with AD/HD-only, children with comorbidity did not show significantly impaired behavioral outcomes; and when compared to children with LD-only, they did not show significantly impaired academic outcomes.

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Attention-deficit/hyperactivity disorder (AD/HD) is a neurobiological disorder characterized by a chronic pattern of inattention and/or hyperactivity-impulsivity. This behavior pattern is exhibited more frequently and is more serious in nature than behavior displayed by individuals at a comparable developmental level (American Psychiatric Association [APA], 2000).

Three subtypes of AD/HD have been identified: (a) AD/HD with a significant pattern of inattentiveness (AD/HD, predominantly inattentive type); (b) AD/HD with significant symptoms of both hyperactivity and impulsivity (AD/HD, predominantly hyperactive-

impulsive type); and (c) AD/HD with significant symptoms of inattentiveness, hyperactivity, and impulsivity (AD/HD, combined type) (APA, 2000). AD/HD has been described as "one of the most important disorders that child and adolescent psychiatrists treat" (p. 978) because of its persistence, interference with typical development and functioning, and prevalence (Cantwell, 1996).

Children and adolescents with AD/HD experience tremendous difficulty in academic performance and achievement (APA, 2000; Barkley, 2006; Biederman, Newcorn, & Sprich, 1991; Hechtman et al., 2004). In

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addition, AD/HD is associated with difficulties or deficits in behavioral performance (APA, 2000; Miranda, Presentacion, & Soriano, 2002). Indeed, Barkley, one of the leading researchers on AD/HD has stated "evidence that behavioral disinhibition, or poor effortful regulation and inhibition of behavior, is in fact the hallmark of this disorder is so substantial that it can be considered fact" (2006, p. 81).

Recent estimates of the prevalence of AD/HD among school-aged children include 3-6% (DeVeough-Geiss et al., 2002), 3-5% (U.S. Department of Health and Human Services, 1999), 6.8% (U.S. Department of Health and Human Services-Centers for Disease Control and Prevention [DHHS-CDCP], 2002), and 7.5% (Leibson, Katusic, Barbaresi, Ransom, & O'Brien, 2001). These rates emphasize that AD/HD is a common disorder of childhood.

Another disorder that commonly occurs in children and adolescents is a learning disability (LD). As defined by the Individuals with Disabilities Education Improvement Act of 2004 (IDEA, 2004), the federal law governing special education and related services in the United States, a specific learning disability is:

a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which disorder may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations.

In general, reading is the most common problem among students with LD (Bell, McCallum, & Cox, 2003). Some students experience difficulties in only one academic area, such as written communication (Mayes, Calhoun, & Crowell, 2000) or math (Mazzocco, 2005). Most of these students, however, have difficulties that span the entire range of academic as well as social areas (C. R. Smith, 2004). Indeed, the defining characteristic of students with LD has come to be known as unexpected underachievement (D. D. Smith, 2004) or an unexpected failure to learn despite "adequate intelligence, schooling, and their parents' best attempts at nurturing" (C. R. Smith, 2004, p. 2).

Although there are large discrepancies in reported prevalence rates of LD from state to state (C. R. Smith, 2004), recent prevalence estimates include 4-6% (Learning Disabilities Association, n.d., para. 1), 7.7% (DHHS-CDCP, 2002), and 6.1% (U.S. Department of Education, National Center for Education Statistics, 2005). Of note is that of the students receiving special education in the United States, approximately half are identified as having an LD (U.S. Department of Education, National Center for Education Statistics).

Previous research has indicated that LD and AD/HD frequently coexist; that is, they are comorbid. Reported

rates of LD among children with AD/HD have varied widely, including 20-25% (Pliszka, 2000), 10-90% (Biederman, Faraone, & Lapey, 1992; Carmichael et al., 1997), and 10-92% (Semrud-Clikeman et al., 1992). A range in the rates of AD/HD among children with LD has also been reported. For example, Carmichael et al. found that 41-80% of students with LD concurrently had AD/HD.

The variability in comorbidity rates of AD/HD and LD may be due largely to inconsistencies in definitions of LD. Thus, when more stringent standards for defining learning disability have been applied, more modest rates of LD have been found in children diagnosed with AD/HD. Using two stricter assessment methods, Semrud-Clikeman et al. (1992) found LD rates of 23% and 17%, respectively, among students who had attention deficit disorder and hyperactivity. More recent investigations have indicated that fewer than 10% of children with AD/HD have learning disabilities when strict LD criteria are applied (San Miguel, Forness, & Kavale, 1996).

In contrast to comorbidity rates within the population of children with AD/HD or LD, an additional statistic of interest concerns the rate of AD/HD and LD comorbidity among *all* school-aged children. Estimates of this nature are scarce in the literature; however, the DHHS-CDCP (2002) has reported that 3.5% of school-aged children have comorbid AD/HD and LD.

The effects of AD/HD or LD (considered individually) on academic outcomes are well documented. However, less work has been carried out on the effects of the two as comorbid disorders on such outcomes. Several studies have pointed to an additive or intensification effect on learning/academic variables when AD/HD and LD occur together, rather than in isolation. A number of these have noted the impact of AD/HD with regard to academic difficulties in students with comorbid AD/HD and LD. For example, Mayes and colleagues (2000) compared Wechsler Individual Achievement Test and IQ scores among children 8-16 years of age with AD/HD, LD, or a combination of the two disorders. Among children with LD, problems with learning were significantly greater among those who also had AD/HD than those who did not, suggesting that AD/HD intensified learning problems in children with LD. Similarly, Tirosh, Berger, Cohen-Ophir, Davidovitch, and Cohen (1998) noted that, based on teachers' reports, children with combined LD and AD/HD performed significantly poorer in many areas of academic achievement than students with LD alone. Further, with regard to academic grades, McNamara, Willoughby, Chalmers, and YLC-CURA (2005) found that students without LD reported higher grades than students with LD, who, in

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turn, reported higher grades than adolescents with AD/HD and LD.

The impact of LD on academic problems in students with comorbid AD/HD and LD has also been noted. Faraone, Biederman, Monuteaux, Doyle, and Seidman (2001) found that the presence of LD among boys 6-17 years of age who had AD/HD predicted poorer achievement scores at four-year followup than for boys with AD/HD alone. The authors stated that their results "show that, although ADHD itself is a risk factor for academic difficulties, these deficits are more severe in ADHD youth with concomitant LD" (p. 227). Students with both disorders exhibited significantly higher rates of grade repetition, remedial tutoring, and placement in special classes than their peers with AD/HD only.

The need for increased special education services among students with comorbid AD/HD and LD has also been addressed by others. Summarizing the results of several empirical investigations, San Miguel et al. (1996) concluded that when AD/HD (or another disorder) is comorbid with LD, it appears that there is an increased need for special education support. Moreover, the DHHS-CDCP (2002) reported that among children with comorbid AD/HD and LD, 64.7% were receiving special education services compared to 45.9% of children with LD alone, and 11.7% of children with AD/HD-only.

AD/HD alone has been more closely associated with behavioral difficulties than LD-only. In a study of children with ADHD, ADD, emotional disturbance (ED), or LD, Palomares (1991) found that children with ED and those with ADHD/ADD exhibited the most deviant behavior. In a study of students with ADD without hyperactivity (ADD/WO), ADD with hyperactivity (ADD/H), or LD, Stanford and Hynd (1994) found general support for their hypothesis that the behavior of children in the ADD/WO group was more similar to the behavior of children in the LD group. However, they also found that students in both ADD subtypes exhibited behavioral symptoms that were not displayed to the same degree by students with LD.

With regard to the combined effect of AD/HD and LD on behavioral outcomes, findings closely parallel those related to academic outcomes: Data generally support an additive or intensification effect when AD/HD and LD occur together, rather than in isolation. Several researchers have investigated the impact of AD/HD with regard to behavioral difficulties in students with comorbid AD/HD and LD. Flicek (1992), for example, found that among boys in second through sixth grade, those with AD/HD and LD were reported (via peer nominations and ratings) to be more disruptive and to start more fights than boys with LD alone. Flicek also noted that teachers rated students with comorbid AD/HD and LD as exhibiting significantly more difficulties with

cooperation, self-control, and oppositional/defiant behavior than students with LD only. Similarly, Tirosh et al. (1998) found that teacher ratings of several behavioral outcomes in students with comorbid AD/HD and LD were significantly lower than in students with LD alone. One of the psychosocial variables McNamara et al. (2005) studied among adolescents with and without various disorders (LD-only, AD/HD and LD, neither disorder) was temperament (i.e., activity level, distractibility, sleep/rhythmicity, affect/mood, persistence, and approach). Although no statistically significant differences were found among disorder groups, adolescents with comorbid AD/HD and LD reported a higher level of negative characteristics in all temperament areas than adolescents with LD-only.

There is a paucity of literature on the impact of LD on behavioral difficulties among students with comorbid AD/HD and LD. In one of the existing studies, Pisecco, Baker, Silva, and Brooke (2001) compared 11-year-old boys with both AD/HD and reading disabilities (RD) to boys with AD/HD or RD alone. Results showed that boys who currently showed symptoms of comorbid AD/HD and RD had displayed significantly more difficulty with behavioral control at a younger age (ages 3 and 5) than boys with RD alone. The authors also reported that comorbidity was associated with more behavioral control problems than AD/HD-only.

The implications of comorbidity for school-based assessments and interventions have also been examined. Marshall and Hynd (1997), for example, discussed screening students with AD/HD for certain learning disabilities and monitoring students with attention problems (particularly those without hyperactivity) for potential problems with math performance. In a review of the relationship between AD/HD and reading disabilities, Riccio and Jemison (1998) suggested that because ADHD and RD frequently co-occur, children who are referred for either condition should be assessed for the other condition as well. They recommended that assessments of children referred for potential ADHD be comprehensive enough either to rule out or to identify a co-occurring reading disability. They further suggested that assessments of children who are referred for difficulties in early reading skills be sufficiently comprehensive to include an assessment of behavioral domains. Moreover, Riccio and Jemison supported the notion that concurrent interventions that address language, academic, and behavioral concerns are necessary for children with AD/HD and RD.

Much of the previous research on this topic has been conducted with students from clinical populations, including referrals to diagnostic clinics as well as psychiatric and pediatric settings (e.g., Faraone et al., 2002; Mayes et al., 2000; Tirosh et al., 1998). It is possible that

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children referred to specialty clinics comprise a select group of children, and do not necessarily represent the population of children with AD/HD and/or LD at large (Tirosh et al., 1998). A community sample provides for a potentially more diverse population of children than clinical samples (whose members typically include children with more severe AD/HD or LD symptoms), and therefore might allow for broader generalization.

Further, community samples (e.g., DHHS-CDCP, 2002) often make use of parent reports about the disability status of a child. While some studies have cast doubt on the efficacy of parent reports (e.g., Antrop, Roeyers, Oosterlaan, & Van Oost, 2002; Mitsis, McKay, Schulz, Newcorn, & Halperin, 2000), others have supported their accuracy (e.g., Biederman, Faraone, Monuteaux, & Grossbard, 2004). However, in these studies, parents were asked to report the presence or absence of *symptoms* of a particular disorder, whereas community surveys typically query parents about the presence or absence of the *disorder itself*—a distinct issue and one likely influenced by information parents receive from professionals in regular contact with their child. As such, parents' ability to remember information concerning the disorder status of their child may be a pertinent issue here. In a study examining parental ability to remember medical information about their child, Pless and Pless (1995) found that a high level of agreement existed between maternal reports of serious health conditions exhibited by children and corresponding medical record information.

According to the DHHS-CDCP (2002), few studies have examined the accuracy of parental reports of diagnosed learning and behavioral disorders in children. The DHHS-CDCP postulated, however, that parent reports about diagnosed LD and ADD may be preferred over school or medical record information, because "a parent may be the one informant who can describe findings from evaluations by health care providers and school personnel and also provide detailed information about a child's sociodemographic characteristics" (p. 8). Similarly, parental reports about their children's academic performance have been found to match substantially teacher reports on the same child (Schaefer & Edgerton, 1980) and to have equal predictive validity as adolescent-reported grades (Schuerger & Kuna, 1987), which are frequently used in studies of adolescents.

The present study was designed to (a) estimate the prevalence of comorbid AD/HD and LD among school-aged children in the United States using a large, nationally representative community sample; and (b) examine the impact of this comorbidity on a set of behavioral and academic outcome variables. Based on the cited literature, we hypothesized that (a) children with comorbid AD/HD and LD or AD/HD-only would show a

greater incidence of behavioral problems than children with LD-only, (b) children with comorbid AD/HD and LD or LD only would show a greater incidence of academic problems than children with AD/HD-only, and (c) comorbidity of AD/HD and LD would show an intensification of adverse academic outcomes when compared to LD-only. Investigation of the effects of comorbidity on these outcomes is important, because the results may be used to inform school-based behavioral and academic interventions.

## METHODS

### *Instrumentation and Data*

The present study made use of the 2001 National Household Education Survey (NHES), developed by the National Center for Educational Statistics (NCES, 2003a, 2003b). Specifically, we used Volume III of the data set, which contains responses from a parent or head of household (hereafter "parent") of 9,583 school-aged children aged 5-15 attending kindergarten through grade eight in the United States. Participants were contacted by phone via random-digit dialing from January 2 through April 14, 2001, and computer-assisted interviews were administered. The survey was administered with the primary goal of obtaining information regarding relative and non-relative care of children during non-school hours, in addition to participation in before- and after-school programs, activities, and self-care. The surveyed households included families with children attending public and private schools, as well as families with home-schooled children. The sampling scheme was designed to provide a good representation of civilian households in the United States and to provide "reliable national estimates" (NCES, 2003a, p. 5).

For the purposes of the present study, we considered responses from parents of children currently attending public or private schools. Specifically, responses to the following survey questions were examined: (a) "Does (child) have a specific learning disability?" (yes/no); (b) "Does (child) have attention deficit disorder, ADD, or ADHD?" (yes/no); (c) "Overall, across all subjects he/she takes at school, does he/she get mostly (A's, B's, C's, D's, F's)?"; (d) "Have any of (child's) teachers or his/her school contacted you (or child's mother, stepmother, foster mother, father, stepfather, foster father, grandmother, grandfather, aunt, uncle, cousin, or the other adults in your household) about any behavior problems he/she is having in school this year?" (yes/no); (e) "Have any of (child's) teachers or his/her school contacted you (or child's mother, stepmother, foster mother, father, stepfather, foster father, grandmother, grandfather, aunt, uncle, cousin, or the other adults in your household) about any problems he/she is having

with school work this year?" (yes/no); (f) "During this school year, has (child) had an out-of-school suspension or been expelled from school?" (yes/no); and (g) "Since starting kindergarten, has child repeated any grades/ kindergarten?" (yes/no). For the grade repetition variable, we recoded the responses to reflect the presence or absence of grade repetition within three grade level ranges (K-3, 4-6, 7-8).

Finally, we were interested in whether the target child was receiving special education services under the Individuals with Disabilities Education Act. Therefore, we considered parental responses to the survey question "Is (child) receiving services for his/her disability/disabilities through an Individualized (Family Service Plan, or IFSP/Educational Program, or IEP)?"

Although it was not possible to fully ensure the accuracy of the parent responses used in the present study, several aspects of the survey may have helped to increase accuracy. First, the queries about AD/HD status and behavioral and academic outcomes of the children were embedded within the context of a comprehensive and in-depth set of survey questions, enhancing the prospect that respondents would develop some level of comfort and trust with the interviewer. Second, the data were collected in a manner that ensured participant anonymity. Third, data were based on parent reports of children currently attending school (rather than retrospective reports), thereby reducing inaccuracies that could result from parental lapses in memory.

### Procedure

To estimate the prevalence of AD/HD and LD comorbidity, we analyzed data from all 9,583 children in the

data set and computed the relative frequency of each disorder: comorbid AD/HD and LD (AD/HD + LD), AD/HD with no LD (AD/HD-only), and LD with no AD/HD (LD only), along with standard errors and associated confidence intervals. Additionally, the prevalence of LD among children with AD/HD, as well as the prevalence of AD/HD among children with LD, was estimated by constructing a 2 x 2 cross-classification table (AD/HD status by LD status), and computing the percentages of children in each of the categories.

To determine how a child's parent-reported AD/HD and/or LD status was related to the categorical behavioral and academic outcome variables, we considered data from the children in the data set ( $n = 1,167$ ) with a disorder (i.e., comorbid AD/HD + LD, AD/HD-only, and LD-only), and computed the frequency and percentage of students within each disorder category showing "undesirable" academic or behavioral outcomes, along with standard errors and 95% confidence intervals.

Significance was determined by comparing these intervals for the groups of interest (with lack of overlap indicating significance,  $\alpha = .05$  level). Effect sizes (the phi coefficient, which indicates degree of association between a pair of binary variables) were computed to assess the magnitude of the effect when pairs of disorders were assessed on each outcome. To reduce intra-household dependencies in the data, a single, randomly selected case (child) was selected from each household, resulting in a working sample of  $n = 970$ .

## RESULTS

### Prevalence of Comorbid AD/HD + LD

To address the occurrence of comorbid AD/HD + LD,

**Table 1**  
*Frequency and Percentage of Children Within Each Disorder Category*

Disorder Status	<i>n</i>	Percent	Standard Error	95% Confidence Interval
AD/HD + LD	358	3.7	0.25	(3.21, 4.19)
AD/HD-only	343	3.6	0.25	(3.12, 4.08)
LD-only	466	4.9	0.29	(4.34, 5.46)
Neither AD/HD nor LD	8416	87.8	0.43	(86.95, 88.65)
<b>Total</b>	<b>9583</b>	<b>100.0</b>		

Note. Standard errors have been adjusted by the root design effect (DEFT).

**Table 2**  
*Cross-Classification of AD/HD Status With LD Status*

	LD	No LD	Total
AD/HD	358	343	824
No AD/HD	466	8,416	8,882
<b>Total</b>	<b>824</b>	<b>8,759</b>	<b>9,583</b>

we considered the sample and computed the frequency and percentage of children with each disorder. Table 1 shows the distribution of children by disorder status. Out of the total number of children ( $n = 9,583$ ), 358 (3.7%) had comorbid AD/HD + LD, 343 (3.6%) had AD/HD-only, and 466 (4.9%) had LD-only.

We also estimated the relative occurrence of comorbid LD among children with AD/HD, as well as the occurrence of comorbid AD/HD among children with LD. Table 2 shows the cross-classification of all children in the data set by disorder status. Of the 824 children who were reported by parents as having AD/HD, 358 (43.4%) were indicated to have a comorbid learning disability. Among the 701 children with a learning disability, 51.1% were reported by their parents as having comorbid AD/HD.

#### ***Effect of Comorbid AD/HD + LD on Behavioral Outcomes***

The next research question concerned the effect of the various disorders on behavioral and academic outcomes. Table 3 shows the percentage of children within each disorder category whose parents were contacted by teachers regarding behavioral problems, along with standard errors and 95% confidence intervals for these percentages. Based on a comparison of the confidence intervals (specifically, examining for lack of overlap), parents of children with AD/HD + LD and children with AD/HD only were significantly more likely to be contacted by the teacher for child behavioral problems than parents of children with LD-only. A weak-to-moderate effect size ( $\phi = .26$ ) was evident for this difference. However, no significant difference existed between children with comorbid AD/HD + LD and children with AD/HD-only, and a small effect size was observed ( $\phi = .07$ ). When we used suspension/expulsion as the behavioral outcome, no significant differences were

evident among any of the three disorder categories (see Table 3). Further, small effect sizes resulted when children with comorbid AD/HD + LD were compared to children with AD/HD only ( $\phi = .03$ ) and children with LD only ( $\phi = .10$ ) on this question.

#### ***Effect of Comorbid AD/HD + LD on Academic Outcomes***

In a similar manner, we compared children from each of the three disorder categories on three academic outcome variables. Table 4 shows the percentage of children within each disorder category whose parents were contacted regarding problems with school work. As illustrated, parents of children with comorbid AD/HD + LD were significantly more likely to be contacted than parents of children with AD/HD-only. A similar pattern emerged when we considered the academic outcomes "child received average grades of 'C' or lower" and grade repetition, with parents of children with comorbid AD/HD + LD reporting significantly lower grades and more grade repetition than parents of children with AD/HD-only. Effect sizes indicated that the magnitude of the proportional difference in these academic outcomes was small (with all values  $< .22$ ). Additionally, for two of the three academic outcomes (grades of 'C' or lower and grade repetition), a significant ( $p < .05$ ) difference was apparent between children with LD only and children with AD/HD only. However, no significant difference was apparent for any of the three academic variables when children with comorbid AD/HD + LD were compared to children with LD-only.

In sum, it appeared that the presence of comorbid AD/HD + LD exerted an additive effect over the presence of AD/HD-only on academic outcomes, but exerted no intensification effect over LD-only.

**Table 3**  
***Frequency and Percentage of Children Within Each Disorder Status Category With Specific Behavioral Outcomes***

<b>Teacher Contacted Parents Regarding Behavioral Problems</b>				
<b>Disorder</b>	<b><i>n</i></b>	<b>Percent</b>	<b>Standard Error</b>	<b>95% Confidence Interval</b>
AD/HD + LD	151	50.7	2.90	(44.99, 56.35)
AD/HD-only	123	43.9	2.97	(38.12, 49.74)
LD-only	96	25.5	2.25	(21.12, 29.94)

  

<b>Child Suspended or Expelled</b>				
<b>Disorder</b>	<b><i>n</i></b>	<b>Percent</b>	<b>Standard Error</b>	<b>95% Confidence Interval</b>
AD/HD + LD	47	15.8	2.11	(11.63, 19.91)
AD/HD-only	39	13.9	2.07	(9.87, 17.98)
LD-only	34	9.0	1.48	(6.14, 11.94)

**Table 4**  
***Frequency and Percentage of Children Within Each Disorder Status Category With Specific Academic Outcomes***

<b>Teacher Contacted Parents Regarding School Work</b>				
<b>Disorder</b>	<b><i>n</i></b>	<b>Percent</b>	<b>Standard Error</b>	<b>95% Confidence Interval</b>
AD/HD + LD	179	60.0	2.84	(54.51, 65.63)
AD/HD-only	125	44.6	2.97	(38.82, 50.47)
LD-only	188	50.0	2.58	(44.95, 55.05)

  

<b>Child Received Average Grades of C or Lower</b>				
<b>Disorder</b>	<b><i>n</i></b>	<b>Percent</b>	<b>Standard Error</b>	<b>95% Confidence Interval</b>
AD/HD + LD	116	52.3	3.31	(45.68, 58.82)
AD/HD-only	83	35.6	3.14	(29.47, 41.77)
LD-only	139	49.3	2.98	(43.46, 55.13)

  

<b>Child Repeated a Grade</b>				
<b>Disorder</b>	<b><i>n</i></b>	<b>Percent</b>	<b>Standard Error</b>	<b>95% Confidence Interval</b>
AD/HD + LD	87	29.2	3.72	(21.57, 35.86)
AD/HD-only	31	11.8	2.18	(6.84, 14.99)
LD-only	109	30.9	3.44	(22.14, 34.78)

**Table 5**

***Frequency and Percentage of Children Within Each Disorder Category Receiving IFSP/IEP Services***

<b>Disorder</b>	<b><i>n</i></b>	<b>Percent</b>	<b>Standard Error</b>	<b>95% Confidence Interval</b>
AD/HD + LD	158	55.4	2.94	(49.67, 61.12)
AD/HD only	64	26.6	2.84	(20.98, 32.13)
LD only	216	71.5	2.60	(66.43, 76.61)

***Interaction Effects***

As a followup analysis, we examined how ethnicity, gender, and student grade level interacted with child disorder status to affect the behavioral and academic outcomes. Logit modeling, a technique used to examine associations among two or more categorical variables (see DeMaris, 1992), was used for this analysis. Results indicated no significant ( $p > .05$ ) interactive effects for ethnicity or gender, except for the outcome of grade repetition. For this outcome, a significant disorder-status X ethnicity interaction was evident ( $\Delta\chi^2 [df = 4] = 10.23, p < .05$ ). Specifically, White children with AD/HD-only or with LD-only were least likely to have repeated a grade, followed by Hispanic children, then Black children. This differed from the pattern of grade repetition for children with comorbid AD/HD + LD, where Hispanic children were least likely to have repeated a grade, followed by White children, then Black children.

***Reception of IFSP/IEP Services***

As an additional followup analysis, we investigated whether reception of IFSP/IEP services differed by disorder status. To assess this, we computed the proportion of children within each of the three disorder categories whose parents reported that they were receiving IFSP/IEP services (see Table 5). When we compared the confidence intervals for these proportions, all three disorder categories differed from one another. Specifically, children with LD were most likely to receive services, followed by children with comorbid AD/HD + LD, and children with AD/HD only. Followup logit analyses showed no significant ( $p > .05$ ) gender X disorder, ethnicity X disorder, or grade level X disorder interaction effects on reception of services.

**DISCUSSION**

The purpose of this study was to (a) estimate the prevalence of parent-reported comorbid AD/HD + LD among school-aged children in the United States and (b) examine the impact of this comorbidity on selected behavioral and academic outcome variables. When prevalence was examined, the results indicated that 3.7% of the children were reported by a parent to have comorbid AD/HD + LD. This figure is strikingly similar to the 3.5% prevalence rate reported in the DHHS-CDCP summary (2002) of the 1997-98 National Health Interview Survey data. Of note is that the DHHS-CDCP survey, like the National Household Education Survey used in the present study, involved a nationally representative household sample. In the DHHS-CDCP survey, information on sociodemographic characteristics of sample children living in the households was obtained by interviewing an adult family member, of whom over 90% were parents. In the present study, 93.2% of respondents were parents. The reported rates of AD/HD only and LD only (3.6% and 4.9%, respectively) were also very similar to the estimates reported in the DHHS-CDCP study (3.3% for AD/HD only and 4.2% for LD only).

Results of the present study also showed that among children who were reported by parents as having AD/HD, 43.4% had comorbid LD; among children with LD, 51.1% were reported as having comorbid AD/HD. Although these values appear to be in the midrange of the wide span of estimates reported in the literature, the 43.4% figure is higher than the estimated rate of LD among children with AD/HD when "strict" definitions of LD have been used (e.g., San Miguel et al., 1996; Semrud-Clikeman et al., 1992), suggesting that parents in this study may have used less stringent definitions of LD when responding to the survey query.

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### **Behavioral Outcomes**

This study also examined the effects of the various disorder categories on behavioral outcomes. With regard to the first behavioral outcome, teacher contacting parents regarding child behavior problems, results indicate that such contact was significantly greater for students with comorbid AD/HD + LD than for students with LD-only, supporting the findings of earlier research by Flicek (1992), Tirosh et al. (1998), McNamara et al. (2005), and Pisecco et al. (2001). In addition, our results indicate that parents of children with AD/HD-only were contacted significantly more frequently regarding behavioral problems than parents of children with LD-only.

Although no significant differences were found among disorder categories with regard to the second behavioral outcome, suspension and expulsion, the observed sample statistics for children with comorbidity were more adverse than for children with LD-only. Hence, our first hypothesis, that children with parent-reported comorbid AD/HD + LD or AD/HD-only would show a greater incidence of behavioral problems than children with LD-only, was partially supported.

The impact of AD/HD on behavioral outcomes seen in the present study is not surprising, given current perspectives on this disorder. Alluding to deficient rule-governed behavior as a primary deficit or an associated condition in children with AD/HD, Barkley noted that:

these children [are] described as not listening, failing to initiate compliance to instructions, being unable to maintain compliance to an instruction over time, and being poor at adhering to directions associated with a task. All these descriptors are problems in the regulation and inhibition of behavior, especially by rules. (2006, p. 133)

### **Academic Outcomes**

The results of this investigation indicate that for all three academic variables, comorbidity led to significantly poorer outcomes than the presence of AD/HD alone. These findings support earlier work by Faraone et al. (2001), who found that AD/HD + LD had more adverse effects on academic outcomes than the presence of AD/HD-only. Furthermore, for two of the three academic variables (grades lower than C and grade repetition), students with LD-only performed worse than their counterparts with AD/HD-only. Hence, our third hypothesis, that children with comorbid AD/HD + LD or LD-only would show a greater incidence of academic problems than children with AD/HD-only, was generally upheld. Taken together, these results point to the important contribution of the presence of a learning disability to academic variables, lending further support

to the phenomenon of unexpected underachievement associated with learning disabilities.

The results of this investigation also indicate that for all three academic outcomes examined (teacher contact regarding school work, C grades or lower, and grade repetition), comorbid AD/HD + LD did not exert a significantly greater negative impact over the presence of LD-only. These findings do not support previous research (Mayes et al., 2000; McNamara et al., 2005; Tirosh et al., 1998), which suggested an additive or intensification effect on learning and academic variables when AD/HD and LD occur together compared to LD-only. Hence, our third hypothesis, that comorbidity would result in an intensification of adverse academic outcomes compared to LD in isolation, was not supported.

Several explanations for the differences between these findings and those of previous studies may be posited. First, it has been noted that academic deficits tend to be most pronounced in children with the subtype of AD/HD without hyperactivity (predominantly inattentive type) (Marshall & Hynd, 1997) or in children with subtypes of AD/HD characterized by inattention (predominantly inattentive type and combined type) (APA, 2000). One possibility is that students with the predominantly inattentive and/or combined type of AD/HD were underrepresented in the current study. This cannot be determined, however, because the survey data do not distinguish among the various AD/HD subtypes. A second possible explanation is that the severity level of learning disabilities reported by parents of the students in the LD-only group was greater than that of the learning disabilities reported by the parents of students with AD/HD + LD.

### **Interaction effects**

The present study also found no significant interaction effects of ethnicity, gender, or grade level with child disorder status on the parent-reported academic and behavioral outcomes (with the exception of grade repetition). That is, differences in these outcomes among disorder categories did not vary by ethnicity, gender, or grade, suggesting that the effects of these disorders remain fairly constant across these demographic characteristics.

### **Reception of IFSP/IEP Services**

Our results, like those of the DHHS-CDCCP study (2002), show that significantly fewer students with AD/HD-only received special education services than students with comorbid disorders or LD-only. A very likely explanation for this finding is that many students with AD/HD receive modifications and accommodations under Section 504 of the Rehabilitation Act of 1973 (a U.S. civil rights law that prohibits discrimination against individuals with disabilities) rather than

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IDEA (Friend & Bursuck, 2006). Students served under Section 504 do not have IFSPs or IEPs, and thus would not have been considered in the current study.

Previous research has also shown that students with comorbid AD/HD + LD receive services at higher rates than students with LD alone (DHHS-CDCP, 2002). By contrast, our results indicate that children with LD-only and children with comorbid AD/HD + LD did not differ significantly in this respect, suggesting that AD/HD added little to this outcome. These results would lend support to the previous suggestion that the severity level of the learning disabilities reported by parents of the students in the LD-only group was greater than that of the learning disabilities reported by the parents of students with AD/HD + LD.

The results related to the reception of IFSP/IEP services yielded another notable finding. That is, data from the DHHS-CDCP (2002) survey (collected in 1997-98) showed that only 12% of students with AD/HD received special education services. Our data (collected in 2001) indicate that 26.6% of students with AD/HD were receiving special education services, representing more than a twofold increase in special education services in only a few years. Historically, children with AD/HD were not eligible to receive special education services under IDEA, unless they also met criteria for one of the other major disability categories within IDEA; for example, a learning disability (DuPaul, Eckert, & McGoey, 1997). However, when IDEA was reauthorized in 1997, AD/HD was included as a specific example of the "Other Health Impaired" disability category. It is possible that as parents have become increasingly aware of this change, they have advocated for special education and related services on the basis of an AD/HD diagnosis alone.

### **Limitations**

Although other studies have examined AD/HD + LD comorbidity issues, few have investigated this topic using large nationally representative samples. The study conducted by the DHHS-CDCP (2002) examined the impact of comorbid AD/HD + LD on the use of health care services and other health conditions using such a sample. The only school-related variable reported in the DHHS-CDC study, however, was the use of special education services. The present study extends this work by examining how additional behavioral and educational outcomes (teacher contact regarding behavioral problems, suspension/expulsion, teacher contact regarding school work, grades of C or lower, and grade repetition) are related to AD/HD + LD comorbidity.

As this study is the first of its kind to examine the impact of comorbid AD/HD + LD on specific behavioral

and academic variables using a large, national, household sample, we consider these findings to be preliminary. Hence, future research should be conducted to confirm or refute the results. Also, a limited set of parent-reported behavioral and academic outcomes was used in this study. In addition, the study relied on parent reports of disorder status, and although there is evidence to support the validity of such reports, this may still be viewed as a limitation inherent in this type of study. Moreover, the survey question pertaining to the presence of ADD or AD/HD did not discriminate among the different subtypes of AD/HD. Future research might examine a broader array of behavioral and academic outcomes, use a variety of reporting sources, and include data on different subtypes of AD/HD.

### **Implications for Practice**

As previously indicated, Riccio and Jemison (1997) recommended that assessments of children who are referred for potential AD/HD be comprehensive enough to rule out or identify a potential reading disability. In a similar fashion, these authors suggested that assessments of children referred for early reading difficulties be broad enough to include an assessment of behavioral domains. The substantial levels of comorbidity found both in this study and in previous research support this recommendation; that is, a diagnosis of one disorder should alert school personnel to the possibility that the other disorder is also present. Hence, when a child is diagnosed with a learning disability, for example, it may be wise to screen for AD/HD; the presence of AD/HD may herald behavioral difficulties for which specific interventions are warranted. Similarly, when a child presents with AD/HD, the possibility of an LD should be considered; a learning disability may be associated with increased academic problems that require specialized interventions. Faraone et al. (2001), whose research found that although AD/HD alone is a risk factor for academic difficulties, these problems are even more severe in youth with AD/HD who have coexisting LD, suggested "the need to develop appropriate screening techniques to identify ADHD children with comorbid LD who likely require more extensive psychoeducational interventions" (p. 228). In sum, the presence of comorbid AD/HD + LD, compared to either disorder in isolation, may have important ramifications for informing school-based behavioral and academic assessment and intervention.

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