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*J Atten Disord* 2009; 12; 525 originally published online Jul 2, 2008;
DOI: 10.1177/1087054708320438

The online version of this article can be found at:
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Effects of Comorbid ADHD With Learning Disabilities on Anxiety, Depression, and Aggression in Adults

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Objective: ADHD and learning disabilities (LD) frequently coexist and there are indications that comorbidity may increase the risk of psychopathology. Method: The current study examined the gender distribution and frequency of comorbidity and its impact on the prevalence of symptoms of anxiety, depression, and aggression in a clinic sample of 80 adults with ADHD, aged 18 to 58 years. More individuals were diagnosed with ADHD+LD than ADHD only, with no difference in this distribution according to gender. Results: A factorial multivariate analysis of variance indicated that females with ADHD+LD displayed more cognitive depression than females with ADHD only and than males with ADHD+LD and ADHD only. However, individuals with ADHD only and individuals with ADHD+LD did not differ on overall anxiety, depression or aggression. Likewise, males and females did not differ on measures of psychopathology. Conclusion: This study lays the foundation for continued research into the characteristics and comorbidities of adults with ADHD. (J. of Att. Dis. 2009; 12(6) 525-531)

Keywords: ADHD; learning disabilities; comorbidity; depression; adults

ADHD is one of the most common childhood disorders with behavioral and cognitive difficulties generally emerging before the age of 7 years (American Psychiatric Association, 2000). More recently, however, ADHD has been found to appear later in childhood or mid-adolescence (Rohde et al., 1999; Willoughby, Curran, Costello, & Angold, 2000), and to persist into adulthood in 30% to 90% of childhood cases (e.g., Adler, 2004; Bellak & Black, 1992; Biederman et al., 2006; Biederman, Mick, & Faraone, 2000; Faraone, Biederman, Feighner, & Monuteaux, 2000). Although these findings have prompted increased attention, further research is needed to clarify the prevalence and correlates of ADHD in adults (Kessler et al., 2006).

High rates of comorbidity have been reported within the ADHD population in both epidemiological and clinical samples (e.g., Adler, Sitt, Nierenberg, & Mandler, 2006; Biederman et al., 1993; Biederman, Newcorn, & Sprich, 1991; Kollins, 2007; Mayes, Calhoun, & Crowell, 2000). ADHD frequently coexists with learning disabilities (LD; e.g., Mayes et al., 2000), with disruptive behavior disorders including conduct disorder (CD) and oppositional defiant disorder (ODD; e.g., Biederman et al., 1993; McGough et al., 2005), and with psychopathologies such as anxiety and depression (e.g., Adler et al., 2006; Lomas & Gartside, 1997; McGough et al., 2005). Although prevalence varies with the diagnostic criteria used (Epstein, Shaywitz, Shaywitz, & Woolston, 1991), high lifetime prevalence rates of comorbidity are reported in both children and adolescents (44% to 86%; Kuhne, Schachar, & Tannock, 1997; Newcorn et al., 2001; Rucklidge & Tannock, 2001), as well as in adults (40% to 82%; Biederman et al., 1993; Milberger, Biederman, Faraone, Murphy, & Tsuang, 1995). Patterns of psychopathology appear similar across age groups, suggesting that the findings from childhood studies can serve as a foundation for comorbidity research in adults with ADHD (Biederman et al., 1993).

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Researchers have described a strong link between ADHD and LD (Javorsky, 1996; Jensen, Martin, & Cantwell, 1997). Although the diagnostic criteria presents clear distinctions between the core symptoms of ADHD and LD (American Psychiatric Association, 2000), certain features and disorders associated with both ADHD and LD can cause the boundaries to become blurred (Jensen et al., 1997). Symptom similarities between the disorders include problems with inattention and hyperactivity, low frustration tolerance, poor self-esteem, low morale, deficits in social skills, impaired academic achievement, increased school drop out and poor vocational achievement (American Psychiatric Association, 2000; Epstein et al., 1991; Jensen et al., 1997). As a result of overlapping symptoms, individuals are often diagnosed with a comorbid ADHD and LD condition (ADHD+LD).

There is widespread evidence that both individuals with ADHD and individuals with LD are at risk for concomitant emotional and behavioral difficulties, such as anxiety, depression, and aggression. For example, individuals with ADHD have been found to experience elevated rates of anxiety (2 to 4 times), depression (2 to 6 times), and aggression when compared with control populations (Biederman et al., 1991; Biederman et al., 1993). Anxiety has been found to coexist with ADHD in 20% to 50% of adult cases (Biederman et al., 1993; Milberger et al., 1995), whereas depression has been found to occur with ADHD in 8% to 44% of adult cases (Biederman et al., 1993; Lomas & Gartside, 1997; Milberger et al., 1995).

ADHD is also commonly associated with disruptive behavior disorders such as ODD and CD (e.g., Rapport, Scalan, & Denney, 1999). In adults with ADHD, the prevalence rates for coexisting ODD and CD range from 29% to 53% and 20% to 53%, respectively (Biederman et al., 1993). High correlations between disruptive behavior disorders and variables relating to aggression have been documented (Hudziak, Rudiger, Neale, Heath, & Todd, 2000; Mayes et al., 2000). Research by Rapport et al. (1999) has also indicated that individuals with ADHD may be particularly prone to aggressive and delinquent behaviors.

Studies have also demonstrated a link between LD and measures of anxiety (e.g., Bender & Wall, 1994; Cantwell & Baker, 1991; Fisher, Allen, & Kose, 1996), depression (e.g., Hoy et al., 1997) and disruptive behavior disorders/aggression (e.g., Church, Lewis, & Batshaw, 1997; Javorsky, 1996). The reported prevalence of comorbid ODD, CD, depression, and anxiety ranges between 10% to 25% in individuals diagnosed with a LD (American Psychiatric Association, 2000; Cantwell & Baker, 1991).

The apparent elevated risk for concomitant emotional and behavioral difficulties in both individuals with ADHD and individuals with LD suggests that individuals with the comorbid condition of ADHD+LD may be at even greater risk of anxiety, depression, and aggression symptomatology than individuals with ADHD only. This contention has some support in the literature. For example, the ADHD+LD condition has been linked with a negative prognosis with regard to cognitive, academic, and behavioral development (Church et al., 1997; Pisecco, Baker, Silva, & Brooke, 2001), as well as social and emotional development (Bender & Wall, 1994; Biederman et al., 1993). However, further investigation is required (Bender & Wall, 1994; Livingston, Dykman, & Ackerman, 1990), particularly with respect to adult populations.

The impact of gender in individuals with ADHD is also in need of clarification. ADHD is more often diagnosed in males, with male-to-female ratios varying from 3 to 1 in epidemiological studies and 9 to 1 in clinical populations (Arcia & Conners, 1998). The diagnostic rate for adults with ADHD, however, has been reported to be equally divided among men and women (Biederman, 2004). Gender-based comparisons are limited. There are indications that females may be somewhat less likely to receive a dual diagnosis of ADHD+LD. In a study of 153 boys and 29 girls with ADHD, for example, Livingston et al. (1990) reported that the sample comprised 59% ADHD only (48% boys and 11.5% girls) and 41% ADHD+LD (35.6% boys and 5.2% girls). In a study by Javorsky (1996), the ADHD+LD sample consisted of only male children and adolescents, whereas females comprised approximately half the ADHD only group.

The evidence relating to gender differences in vulnerability to further psychiatric diagnoses in individuals with ADHD remains equivocal. In a study of a clinical population of individuals with ADHD, Ruczkidge and Tannock (2001) reported that females were more impaired than their male counterparts on measures of distress, anxiety, depression, CD, ODD, and cognitive problems. In contrast, a meta-analysis of literature on gender differences in children with ADHD undertaken by Gaub and Carlson (1997) demonstrated that girls with ADHD display significantly lower levels of anxiety, depression, aggression, and CD than boys. In addition, Carlson, Tamm, and Gaub (1997) found significantly lower levels of aggression in girls than boys with ADHD, and Biederman et al. (2002) reported that girls with ADHD were at less risk for comorbid major depression than boys.

In reference to gender differences in psychiatric symptoms in the ADHD+LD population, Livingston et al. (1990) found that only 17% of girls were likely to
be diagnosed with anxiety and depression in comparison to nearly 48% of boys. However, the likelihood of an additional diagnosis of ODD and CD was equally prevalent in girls (38%) and boys (41%). There remains a need for further research to clarify any gender differences in susceptibility to additional diagnoses in ADHD and ADHD+LD populations.

The frequent comorbidity of ADHD+LD is well established. In contrast, research into the characteristics of adults with ADHD and ADHD+LD remains equivocal. The question of whether adults with ADHD+LD have higher rates of additional diagnoses in comparison to adults diagnosed with ADHD only is yet to be determined and the impact of gender also requires clarification.

Method

Participants

The sample was composed of 80 adults diagnosed with ADHD (43 males and 37 females) ranging in age from 18 to 58 years ($M = 32.45$ years, $SD = 9.44$) and with a full-scale IQ (FSIQ) of 70 or above on the Wechsler Adult Intelligence Scale–Revised (WAIS-R; Wechsler, 1981) or the WAIS-III (Wechsler, 1997). Sixty percent (SD = 15.55), 10 female ADHD ($M = 33.70$ years of age, $SD = 8.74$), 27 male ADHD+LD ($M = 33.96$ years of age, $SD = 9.89$), and 27 female ADHD+LD ($M = 33.96$ years of age, $SD = 7.99$) participants.

Measures

Cognitive functioning. All participants were assessed with the WAIS-R or the WAIS-III. The Wide Range Achievement Test–Revised (WRAT-R; Jastak & Jastak, 1985) was administered to obtain subtest scores for basic reading, mathematics, and spelling. Consistent with the diagnostic recommendations of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2000), LD was diagnosed if one or more of the WRAT-R subtest scores was significantly lower than predicted from the WAIS-R or WAIS-III FSIQ.

Psychological functioning. The Personality Assessment Inventory (PAI; Morey, 1991) is a multiscale inventory that is used to assess various clinical and personality variables in adults. The inventory is structured, objective, and nonoverlapping in content; it contains 344 items each scored on a 4-point Likert-type scale (Morey, 1991). The instrument yields linear T-scores on all full scales and subscales ($M = 50, SD = 10$). A score of $70T$ represents a pronounced deviation from typical responses of normal community respondents and is considered clinically significant (Morey, 1996). Standardization of the scale was based on a normative sample including the general population ($n = 1,000$), a student population ($n = 1,051$) and a clinical population ($n = 1,246$; Morey, 1991). Among the combined normative sample, the internal consistency reliability of the PAI ranged from $.81$ to $.86$, test-retest reliability ranged from $r = .79$ to $r = .92$, and good convergent and discriminant validity has been demonstrated (Morey, 1991). The PAI has a low reading level, the average being Grade 4, which is beneficial when testing participants with ADHD and LD. For the purpose of this study, three scales were chosen for examination: Anxiety, comprising cognitive, affective, and physiological subscales; Depression, comprising cognitive, affective, and physiological subscales; and Aggression, comprising verbal, physical, and attitude subscales.

Procedure

A clinical facility undertaking assessment of adults with ADHD in Melbourne, Australia, was approached regarding collaborative research. The clinic agreed to make available the assessment results from all adult clients with ADHD who had been assessed during the preceding 3 years. All clients had been assessed by registered psychologists as part of a routine admissions procedure. Information obtained from the files included age, gender, whether a diagnosis of LD was made, the FSIQ, and subscale scores for anxiety, depression, and aggression as measured by the PAI.

Results

A univariate ANOVA was used to assess differences between males and females in age and FSIQ, to determine the need for covariates in a factorial between-subjects MANOVA ($2 \times 2$ MANOVA). There were no mean group differences indicating that age and FSIQ would not be included as covariates. Table 1 presents the means, standard deviations, interaction, and main effects of the psychological symptoms by group.

Chi-square test for goodness of fit and chi-square test for independence or relatedness were used to analyze the global and gender differences in the frequency of ADHD-only or ADHD+LD diagnoses. Significantly more of the sample were diagnosed with ADHD+LD ($n = 54$) than ADHD only ($n = 26$), $\chi^2 (1, n = 80) = 9.8, p = .00$. There were no differences in diagnoses (ADHD

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<thead>
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<th></th>
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</table>

Note: A score of >70 is clinically significant (Morey, 1996).

a. Means significantly differ at p < .05.

*p < .05.
only: males \( n = 16 \); females \( n = 10 \); and ADHD+LD: males \( n = 27 \); females \( n = 27 \) on the basis of gender. \( \chi^2 (1, n = 80) = .94, p = .33 \).

A 2 × 2 MANOVA was performed on nine dependant variables: cognitive, affective, and physiological anxiety symptoms; cognitive, affective, and physiological depression symptoms; and attitude, verbal, and physical aggression symptoms. The independent variables were gender (male or female) and diagnosis (with LD or without LD). The multivariate tests were analyzed for significant interaction and main effects using Pillai’s Trace criterion, which is robust to violations of assumptions (Coakes & Steed, 1999).

There was a significant multivariate interaction effect of gender and diagnosis, \( F(9, 68) = 2.56, p = .01 \), partial \( \eta^2 = .25 \). Substantial strength of association was indicated between the gender and diagnosis interaction and the dependant variables (Tabachnick & Fidell, 1996). The observed power of 91% indicated that it was highly probable that a true effect did exist (Gravetter & Wallnau, 1996). The significant multivariate effect for gender and diagnosis indicates further analysis of univariate effects.

There were no significant main effects for diagnosis, \( F(1, 76) = 1.86, p = .07 \), or for gender, \( F(1, 76) = 1.39, p = .20 \). There was thus no overall difference between males and females or between individuals with ADHD+LD and ADHD only with respect to anxiety, depression, and aggression subscale scores.

However, a significant univariate interaction effect was found on the cognitive depression symptom variable, \( F(1, 76) = 8.7, p = .00 \), partial \( \eta^2 = .103 \). Modest strength of association was indicated between gender and diagnosis interaction and the cognitive depression symptom variable (Tabachnick & Fidell, 1996). An observed power of 83% is evidence that the test was effective in determining differences between variables (Gravetter & Wallnau, 1996). Examination of the means revealed that females with ADHD+LD displayed significantly higher levels of cognitive depressive symptoms than females and males with ADHD only and males with ADHD+LD.

**Discussion**

This study examined comorbidity in a clinical sample of adults with ADHD. The primary aim was to determine whether individuals with ADHD+LD presented with higher levels of psychopathology than those with ADHD only, and whether gender impacted symptom presentation.

The finding that significantly more adults were diagnosed with comorbid ADHD+LD than ADHD only confirms that the likelihood of an additional diagnosis of LD is commonplace and comparable to that reported in child and adolescent populations (e.g., Javorsky, 1996; Livingston et al., 1990; Mayes et al., 2000; Newcorn et al., 2001; Rucklidge & Tannock, 2001). Of course, this may be a feature associated with clinical samples in general, or with this particular clinical sample. However, if there are differences between these groups in terms of their risk for psychopathology, or the type of interventions they require, it remains important that comprehensive assessments are undertaken at initial presentation.

The absence of gender differences in the diagnosis of ADHD only and ADHD+LD was contrary to the reported predominance of both types in boys (e.g., American Psychiatric Association, 2000; Javorsky, 1996; Livingstone et al., 1990) and confirms the findings of Biederman (2004) that diagnostic rates in adults are equally divided among men and women. Because there is no evidence that boys outgrow ADHD to a greater degree than girls (Weiss & Weiss, 2004), the increase in gender balance with age is likely to reflect a referral discrepancy. In contrast to children, adults with ADHD are commonly identified through self-referral and less frequently on the basis of hyperactivity and impulsivity symptoms.

Previous research has indicated that children and adolescents with ADHD+LD are at greater risk for anxiety and depression (Javorsky, 1996; Livingston et al., 1990) and display more aggressive and disruptive behaviors than those with ADHD only (Cadesky, Mota, & Schachar, 2000; McGee, Williams, & Silva, 1988; Pisecco et al., 2001). However, the assumption that adults with ADHD+LD would similarly have higher anxiety, depression, and aggression subscale scores than adults with ADHD only was not supported in this clinical sample. Perhaps the disorders ADHD only and ADHD+LD might affect the psychological functioning of adults differently to that reported in children and adolescents. It is also possible that individuals presenting to a clinic for assessment and intervention are biased toward psychopathology, limiting the distinction between the two groups.

Although there was also an overall absence of gender difference in anxiety, depression, and aggression subscale scores, females with ADHD+LD scored significantly higher on cognitive symptoms of depression than males with ADHD+LD, and than males and females with ADHD only. A mean score of 73 is considered clinically significant (Morey, 1996). A combination of ADHD+LD appeared to place females at an increased risk of displaying cognitive symptoms of depression, such as thoughts of worthlessness, hopelessness, and personal failure. This is in contrast to Livingston et al.’s (1990)
report that girls with ADHD+LD were proportionately less likely to receive a diagnosis of anxiety or depression than their male counterparts. Perhaps in females, depression symptoms are more likely to present in association with maturity.

This study has several limitations. First, the data were gathered from a clinical sample and thus findings may not generalize to other populations. Furthermore, the sample size was relatively small, limiting the statistical power for examining the association between groups. It is also important to note that the design lacked a systematic approach to controlling for comorbidity of other psychiatric, cognitive, or behavioral disorders such as ODD, CD, and anxiety-related and mood disorders, possibly leading to confounded results. Furthermore, it was uncertain whether participants had undergone treatment for additional psychological complaints prior to their ADHD diagnosis.

An additional limitation relates to the diagnosis of LD in the ADHD population. It has been long recognized that LD individuals have problems with written expression, including poor paragraph structure, spelling, handwriting, grammar, and punctuation within sentences (White, 1992). Although the WRAT-R tests for basic reading such as decoding of single words, it does not assess composition, written expression, or reading comprehension (Jastak & Jastak, 1985). Thus, individuals with writing disorders, but not disorders relating to reading or mathematics, could have been incorrectly identified as ADHD-only. Tests such as the Wechsler Individual Achievement Test (WIAT) that include a written expression subtest could be useful in deriving a more conclusive diagnosis of LD (Psychological Corporation, 1992).

In summary, despite the caveats mentioned, it was apparent from this study that a comorbid diagnosis of LD is common in adults with ADHD. Females and males were equally affected by ADHD only and ADHD+LD, and there were no overall gender differences on measures of anxiety, depression, and aggression. The exception was the cognitive depression subscale of the PAI, with females with ADHD+LD achieving elevated scores in comparison to males with ADHD+LD and both males and females with ADHD only. The level of comorbidity across groups suggests a need for routine assessment of psychopathology in all individuals with ADHD. This would enable the provision of appropriate treatment to those individuals experiencing additional difficulties. Females with ADHD, most particularly, may benefit from treatment focused on cognitive components of depression.

There is clearly a need for more research into the risks of psychopathology in adults with ADHD, and particularly into whether gender or presence of LD impacts risk. Large-scale studies are needed to explore distinguishing features of ADHD only and ADHD+LD in clinical and epidemiological populations, and longitudinal prospective studies may also be useful to ascertain changes in functioning from childhood through to adulthood.

References


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K. L. Baker is a graduate student from the School of Psychology at Deakin University, Melbourne, Australia, who worked on this project under the supervision of Dr. McGillivray.