Anxiety in College Students With ADHD: Relationship to Cognitive Functioning

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Abstract

Objective: This study sought to explore how anxiety impacts college students with ADHD, especially with regard to cognitive functioning. **Method:** 473 college students with ADHD and a control group of 200 college students without ADHD completed self-report measures of anxiety, ADHD symptomatology and tests of cognitive functioning. **Results:** Students with ADHD reported significantly more anxiety than students without ADHD. Within the ADHD group, the relationship between anxiety and inattention was similar to the relationship between anxiety and hyperactivity/impulsivity. Students with ADHD reported more anxiety with regard to academics compared to life-in-general. There were no gender differences for anxiety; however, freshman indicated more anxiety than upper-classmen. Anxiety and inattention were found to interact such that students with low levels of inattention but high levels of anxiety performed better on tasks of cognitive ability. **Conclusion:** Anxiety in college students with ADHD can take many forms, and interventions require a multi-focused approach. There may be some positive aspects to anxiety. *(J. of Att. Dis. 2015; 19(3) 222-230)*

It has been well documented that children with ADHD have elevated levels of anxiety. Some estimates state that 25% to 35% of children with ADHD experience comorbid anxiety symptoms (Plizka, Carlson, & Swanson, 1999; Tannock, 2000), whereas other investigators put the prevalence rate at 50% (Mancini, Van Ameringen, Oakman, & Figueiredo, 1999). When compared with a control group, children with ADHD were found to have more anxiety in the areas of agoraphobia, simple phobias, separation anxiety disorders, social phobias, and obsessive-compulsive disorder (Spencer, Biederman, & Wilens, 1999); in addition, the authors found that 27% of children with ADHD tended to have more than one anxiety disorder, as compared with only 5% of the control group. Schatz and Rostain (2006) summarized research noting that comorbid anxiety in children with ADHD may moderately reduce commonly seen impulsivity. March et al. (2000) found similar findings; children with ADHD and anxiety exhibited more inattentive symptoms rather than impulsivity. Anxiety paired with ADHD has also been linked to cognitive deficits, working memory difficulties, and problems with daily life functioning (Schatz & Rostain, 2006). A recent study found that a comorbid anxiety disorder in children with ADHD aggravated problems related to inhibition, adjustment to new settings (i.e., cognitive flexibility), and emotional control (Sorensen, Plessen, Nicholas, & Lundervold, 2011).

Although a majority of the comorbidity research has been conducted with children, there is evidence that adults with ADHD also experience elevated levels of anxiety. Some researchers have found evidence of comorbid anxiety among as many as 20% to 50% of adults with ADHD (Biederman et al., 1993). In one of the few studies with college students, Nelson and Gregg (2012) used the Beck Anxiety Inventory (BAI) to compare college students with ADHD, dyslexia, or comorbid ADHD/dyslexia. They did not find differences between the three groups in anxiety; mean scores for all three groups were in the "normal" range (e.g., a BAI score of less than 10). They did not find ADHD subtype differences in anxiety (inattentive vs. combined), nor did they find gender differences for anxiety. However, their sample was fairly small, with only 60 students in their ADHD and control groups. In a study of 84 first-year-in-college psychology majors, a relationship was found between higher ratings of symptoms of ADHD and higher ratings of anxiety symptoms; however, these were not students with a diagnosis of ADHD (Alexander & Harrison, in press).

College students with ADHD may be at risk of anxiety because they encounter unique challenges related to school and the college lifestyle, including difficulties with

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academics, social skills, adaptation to college, and relationships. They tend to have lower achievement success, weaker academic coping skills, lower grade point average (GPA), and a higher likelihood of being placed on academic probation (Heiligenstein, Guenther, Levy, Savino, & Fulwiler, 1999). Reaser, Prevatt, Petscher, and Proctor (2007) found that college students diagnosed with ADHD reported more difficulty with specific study skills than college students without ADHD, including time management, concentration, motivation, anxiety, test taking skills, and study strategies. College students with ADHD may face additional impairment in the area of adapting to the college lifestyle, which involves adjusting to living independently, experiencing social situations with other students, and self-motivation of attending classes and completing coursework; Shaw-Zirt, Popali-Lehane, Chaplin, and Bergman (2005) found that college students with ADHD did not perform as well in the areas of adaptation, social skills, and self-esteem compared with matched comparisons without ADHD. Other studies have found that college students with ADHD report a lower quality of life and negative differences in dating patterns and in relationships with family members compared with their peers without ADHD (Canu & Carlson, 2003; Grenwald-Mayes, 2002). In summary, although there is insufficient evidence documenting anxiety in a college population of students with ADHD, there is a strong rationale for the presence of anxiety due to new challenges associated with college.

Models explaining the phenomenology of ADHD are varied. As reviewed by Schatz and Rostain (2006), many models focus on cognitive processing, dysregulated attentional systems, impaired executive regulation or inhibition, or poorly coordinated reward systems. These models lead to different implications for the relationship between anxiety and ADHD. On the positive side, it is possible that the anxiety associated with ADHD might actually inhibit symptoms of impulsivity, indicating that it will be important to differentially evaluate symptoms of inattention versus those of hyperactivity and impulsivity with regard to anxiety. Alternately, anxiety might lead to a decrease in cognitive efficiency. Both of these effects have been studied in children, but results have been inconsistent (Sorensen et al., 2011).

Related work by Roth et al. (2004) investigated a small sample of adults with ADHD and determined that what might look like a memory deficit or poor organization is actually the result of situational anxiety associated with a task. In general, the high level of state anxiety experienced by the test-anxious person in an evaluative situation activates worry conditions stored in one's memory, and these worry conditions can interfere with the person's performance on a test (Zeidner & Saffir, 1998). It is well documented that test-anxious students do not perform up to their ability when they take tests (Hancock, 2001). However, there is currently insufficient research determining whether college students with ADHD do experience more anxiety than non-ADHD students, and whether they are more likely to experience anxiety related to academics versus anxiety regarding life in general. Understanding the relationship between anxiety, inattention and impulsivity, and cognitive functioning in college students with ADHD has important implications. It might suggest that academic difficulties in students with ADHD might be better ameliorated by reducing test and study anxiety, rather than by trying to remediate cognitive related achievement deficits.

The existing literature on college students also suffers from not evaluating gender differences with regard to anxiety (Schatz & Rostain, 2006), and no studies of college students have specified additional demographic variables such as year in school. As previously discussed, children with ADHD may struggle with multiple anxiety disorders, more inattention, cognitive and working memory deficits, and problems with daily life functioning; therefore, this study sought to explore how anxiety impacts college students with ADHD, especially with regard to cognitive functioning.

Objective

The purpose of this study was to investigate the various types of anxiety experienced by college students with ADHD. There were five research questions.

Research Question 1: What are levels and types of anxiety in college students with ADHD compared with a control group of students without ADHD?

Research Question 2: Within the ADHD group, is anxiety more highly correlated with symptoms of inattention versus symptoms of hyperactivity/impulsivity?

Research Question 3: Within the ADHD group, are there gender or year-in-college differences in levels and types of anxiety?

Research Question 4: Within the ADHD group, do symptoms of anxiety differ based on situation (anxiety with regard to academics vs. anxiety with regard to life in general)?

Research Question 5: Within the ADHD group, do levels of anxiety and levels of inattention and hyperactivity/impulsivity interact to affect performance on tests of cognitive functioning?

Method

Participants

The sample consisted of 473 college students diagnosed with ADHD and 204 college students without ADHD. The college students who had received a *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.;

DSM-IV-TR; American Psychiatric Association, 2000) diagnosis of ADHD were recruited from a university psychoeducational assessment clinic, and the students without ADHD were recruited from general undergraduate courses. The mean age of the participants was 21.45 (*SD* = 4.28). The race/ethnicity of the participants was as follows: 68% Caucasian, 15% African American, 11% Hispanic, 3% Asian, and 3.5% other. There were no significant differences between the ADHD and control groups with regard to age or ethnicity. Year in school was as follows: 23% freshmen, 23% sophomores, 30% juniors, and 25% seniors. The ADHD group had significantly more freshmen but fewer sophomores than the control group, with similar numbers of juniors and seniors. For those with a diagnosis of ADHD, 45% were primarily inattentive type, 1% primarily hyperactive type, and 54% combined type. Information regarding the number of ADHD participants on medication was unavailable.

Measures

Anxiety Symptom Checklist. An Anxiety Symptom Checklist asked respondents to rate symptoms of anxiety based on *DSM-IV-TR* criteria. This checklist was developed by the clinic from which ADHD participants were recruited. Only two subtypes of anxiety were evaluated, general anxiety and panic, because these were the only two subtypes found to be commonly endorsed by clinic clients. Respondents were asked to rate their symptoms twice; the first time with regard to how they feel "in general" and the second time with regard to how they feel "when studying, taking tests, or thinking about academics." Items depicting generalized anxiety disorder included six items: feeling anxious or worried, difficulty concentrating, restlessness, irritability, sleep disturbance, and being easily fatigued. Items depicting a panic attack included five items: nausea or abdominal distress, fear of losing control, palpitations or accelerated heart rate, trembling or shaking, and shortness of breath or dizziness. Respondents answered "yes" or "no" for each item. Four measures of anxiety from this checklist were utilized in the current study—generalized anxiety (with regard to life in general): total possible score = 0 to 6, Cronbach alpha = .72; panic attacks (with regard to life in general): total possible score = 0 to 5, Cronbach alpha = .66; generalized anxiety (with regard to academics): total possible score = 0 to 6, Cronbach alpha = .74; and panic attacks (with regard to academics): total possible score = 0 to 5, Cronbach alpha = .73.

Academic Success Inventory for College Students (ASICS). The ASICS (Prevatt et al., 2011) is a 50-item measure that evaluates academic success in college students. The subscales measure anxiety (with regard to academics), general academic skills, career decidedness, internal and external motivation, concentration, socializing, personal adjustment, and perceived efficacy of the instructor. The Anxiety subscale includes items that ask the respondent to rate the degree to which they feel nervous or anxious when studying and

taking tests. Only the ASICS Anxiety scale was used in this study. Items are rated on a 7-point Likert-type scale. The scores are then converted to a 100-point scale. The total possible scores range from 7 to 100. A higher score indicates less anxiety. Cronbach alpha for the Anxiety scale is .77. Previous work using this scale showed that the Anxiety subscale discriminated between high and low performing students; in addition, along with the other subscales, Anxiety was able to significantly predict college student grade point average (Prevatt et al., 2011).

Woodcock–Johnson Tests of Cognitive Abilities–Third Edition (WJ-III COG). The WJ-III COG is an individually administered, norm-referenced test of cognition. Subtests were used that were thought to represent core cognitive abilities such as memory, processing speed, and fluid reasoning. The following subtests were used: Auditory Working Memory (a test of short-term auditory memory span, working memory, and divided attention), Memory for Words (short-term memory via lists of unrelated words), Concept Formation (fluid reasoning without a memory component), Visual Matching (the speed at which an individual can make visual symbol discriminations), and Verbal Comprehension (different aspects of language development). Each subtest has a mean of 100 and *SD* of 15. These subtests were utilized because they were the only WJ-III COG subtests routinely given in the evaluation of ADHD by the clinic where data were collected.

The Current ADHD Symptoms Scale. This scale (Barkley & Murphy, 1998) is a self-report measure developed to assess ADHD symptomatology within the past 6 months. There are 18 items, scored on a scale of 0 to 3. A total of 9 items pertain to the ADHD-inattention subtype, and another 9 pertain to the ADHD hyperactive/impulsive subtype. Total scores for the two subtypes were used in this study.

Procedure

For the group with ADHD, archival data were used from clinic clients who had given consent for their evaluation data to be used for research purposes, undergone the clinic's standard evaluation, and received a diagnosis of ADHD. All participants in the group with ADHD had completed an intake form and a checklist of mental health symptoms based on the *DSM-IV-TR*. They also filled out the following self-rating forms, taken from Barkley and Murphy (1998): Current Symptoms Scale–Self-Report Form, Childhood Symptoms Scale–Self-Report Form, Work Performance Rating Scale–Self-Report Form, Employment History Form, Driving History Survey, and a Social History Form. They also had other informants (parents, significant others, friends, etc.) rate their symptoms of ADHD by completing the following forms: the Current Symptoms Scale–Other Report Form, Childhood Symptoms Scale–Other Report Form, Driving History Survey, and the Work Performance Rating Scale–Other Report Form (Barkley & Murphy,

1998), and underwent a clinical interview (Barkley & Murphy, 1998, 2005). Additional information about learning and study strategies was gathered from the Anxiety Symptom Checklist and the ASICS (Prevatt et al., 2011). Cognitive and achievement subtests from the WJ-III COG (Woodcock, McGrew, & Mather, 2001) were administered to rule out the possibility of a learning disability. As part of the standard evaluation, each client was also asked to complete a Michigan Alcohol Screening Test (MAST; Selzer, 1971), which measures problematic drinking behavior. All the above measures had been used in the initial diagnostic process. However, only the following measures were used in the current study: Anxiety Symptom Checklist, the ASICS (Anxiety subscale), Current ADHD Symptoms Scale, and subtests from the WJ-III COG.

Clients had been originally diagnosed with ADHD if the following criteria were met (Murphy & Gordon, 2006, as cited in Barkley, 2006): (a) There was evidence that the student experienced ADHD symptoms in early childhood (ages 5-12; operationalized as endorsing at least 6 of 9 symptoms of inattention or hyperactivity/impulsivity on the self- and other report forms and in the clinical interview); (b) there was evidence that, no later than middle school, these ADHD symptoms led to substantial and chronic impairments across settings; (c) there was evidence that the student was currently experiencing ADHD symptoms (operationalized as endorsing at least 6 of 9 symptoms of inattention or hyperactivity/ impulsivity on the self and other report forms and in the clinical interview); (d) there was evidence that these ADHD symptoms were currently causing substantial and chronic impairments across settings; and (e) there were no explanations other than ADHD that better accounted for the student's current symptoms.

The 204 college students without ADHD were recruited from introductory-level classes in a variety of subjects at the same university and received research credit for their participation. They completed an online survey comprised of the ASICS test anxiety items and the Anxiety Symptom Checklist (the *DSM-IV-TR* symptoms of generalized anxiety and panic attacks). The items on the Anxiety Symptom Checklist were queried twice, once regarding how the student felt "in general" and the second time with regard to how they felt "when studying, taking tests, or thinking about academics." They also responded to questions about prior diagnoses of ADHD or anxiety, and they provided information on their age, gender, ethnicity, and year in school. Four control group participants who reported a previous diagnosis of ADHD were excluded from analyses, for a final sample size of 200.

Results

The first research question (What types of anxiety are evident in college students with ADHD compared with a control group of students without ADHD?) was analyzed using a one-way ANOVA. As can be seen in Table 1, students with ADHD reported significantly more anxiety than the control group on all five measures of anxiety: the ASICS Anxiety subscale (anxiety with regard to studying/ tests), $F(1, 300) = 30.00$, $p < .00$, Cohen's $d = 0.68$; generalized anxiety (with regard to life in general), $F(1, 557) = 185.98$, $p < .00$, Cohen's $d = 1.14$; panic attacks (with regard to life in general), $F(1, 547) = 44.39$, $p < .00$, Cohen's $d = 0.61$; generalized anxiety (with regard to academics), $F(1, 546) = 108.36$, $p < .00$, Cohen's $d = 0.86$; and panic attacks (with regard to academics), $F(1, 541) = 87.59$, $p < .00$, Cohen's $d = 0.88$.

The second research question (Within the ADHD group, is anxiety more highly correlated with symptoms of inattention versus symptoms of hyperactivity/impulsivity?) was analyzed by computing Pearson correlations between the symptoms of inattention and hyperactivity/impulsivity and the anxiety subtests. Symptoms of inattention were significantly correlated with generalized anxiety (with regard to life in general), $r = .21$, $p < .00$; panic attacks (with regard to life in general), $r = .21$, $p < .00$; generalized anxiety (with regard to academics), $r = .21$, $p < .00$; and panic attacks (with regard to academics), $r = .17$, $p < .00$. Symptoms of hyperactivity/impulsivity were also significantly correlated with generalized anxiety (with regard to life in general), $r = .25$, $p < .00$; panic attacks (with regard to life in general), $r = .20$, $p < .00$; generalized anxiety (with regard to academics), $r = .22$, $p < .00$; and panic attacks (with regard to academics), $r = .25$, $p < .00$. A Fisher r to z transformation (two tailed) was calculated to evaluate whether the correlation coefficients were significantly different for symptoms of inattention versus symptoms of hyperactivity/impulsivity. None of the correlations were significantly different based on type of symptoms ($p > .05$ for all tests), indicating that inattention and hyperactivity/impulsivity are equally related to anxiety.

The third research question (Are there gender or year-in-college differences in levels and types of anxiety for students with ADHD?) was analyzed using one-way ANOVAs. There were no main effects for gender on any of the Anxiety subscales ($p > .05$ on all tests). There were main effects for year-in-college for generalized anxiety regarding academics, $F(3, 272) = 11.52$, $p < .00$; panic attacks regarding academics, $F(3, 268) = 9.36$, $p < .00$; and generalized anxiety in general, $F(3, 276) = 2.67$, $p < .05$. Post hoc tests revealed that for generalized anxiety (in general) and panic attacks (with regard to academics), freshmen displayed lower anxiety than juniors or seniors. For generalized anxiety (with regard to academics), freshmen displayed lower anxiety than sophomores, juniors, and seniors.

The fourth research question (Do symptoms of anxiety in students with ADHD differ based on situation, for example, anxiety with regard to academics vs. anxiety with regard to

Table 1. Descriptive Statistics and Group Differences for Anxiety Measures by Diagnosis, Gender, and Year in School.

Variable	Control group (*n* = 200)	ADHD total sample (*n* = 480)	ADHD females (*n* = 217)	ADHD males (*n* = 263)	ADHD freshmen (*n* = 100)	ADHD sophomores (*n* = 75)	ADHD juniors (*n* = 107)	ADHD seniors (*n* = 92)
	M (SD)	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*	*M (SD)*
ASICS anxiety[a]	47.53 (21.32), range = 14-100	33.71 (19.05), range = 14-86	31.69 (18.74), range = 14-100	35.94 (19.26), range = 14-100	36.05 (20.58), range = 14-86	33.08 (22.10), range = 14-100	32.70 (18.29), range = 14-100	30.63 (19.32), range = 14-100
Generalized anxiety (in general)[b]	2.10 (1.76)	4.10 (1.73)	4.18 (1.56)	4.40 (1.87)	3.34 (1.75)	4.02 (2.05)	4.12 (1.65)	4.32 (1.58)
Panic attacks (in general)	0.67 (1.12)	1.49 (1.51)	1.54 (1.49)	1.45 (1.53)	1.10 (1.37)	1.36 (1.46)	1.57 (1.45)	1.47 (1.28)
Generalized anxiety (academics)	2.82 (1.89)	4.31 (1.55)	4.47 (1.40)	4.17 (1.66)	3.45 (1.76)	4.23 (1.37)	4.49 (1.43)	4.57 (1.34)
Panic attacks (academics)	0.68 (1.13)	1.88 (1.55)	2.05 (1.58)	1.73 (1.52)	1.31 (1.44)	1.81 (1.49)	2.13 (1.61)	2.14 (1.48)

Note. ASICS = Academic Success Inventory for College Students.
[a]A higher score on the ASICS indicates less anxiety. A higher score on all other anxiety measures indicates more anxiety.
[b]The range of scores for generalized anxiety (in general) and generalized anxiety (academics) was 0 to 5 for all groups. The range of scores for panic attacks (in general) and panic attacks (academics) was 0 to 6 for all groups.

life in general?) was analyzed using paired samples pairwise comparisons. Participants with ADHD gave greater ratings of anxiety for generalized anxiety with regard to academics compared with generalized anxiety with regard to life in general (*t* = 2.52, *p* < .000, effect size Cohen's *d* = 0.20). Participants with ADHD also gave greater ratings of anxiety for panic attacks with regard to academics compared with panic attacks with regard to life in general (*t* = 5.25, *p* < .000, effect size Cohen's *d* = 0.21).

The fifth research question (Within the ADHD group, do levels of anxiety and levels of inattention and hyperactivity/ impulsivity interact to affect performance on tests of cognitive functioning?) was analyzed using a series of 2 × 2 ANOVAs. The panic and generalized anxiety symptoms with regard to academics were combined to form a single measure of anxiety (range = 0-11, 50th percentile = 6). A median split was used to dichotomize the sample into those with high and low anxiety. The symptoms for inattention were dichotomized using a median split (range = 1-27, 50th percentile = 18). The symptoms for hyperactivity/impulsivity were dichotomized using a median split (range = 1-27, 50th percentile = 12). Dependent measures were the following tests of cognition: Auditory Working Memory, Memory for Words, Concept Formation, Visual Matching, and Verbal Comprehension. The results for symptoms of inattention can be seen in Table 2. There were significant Inattention × Anxiety interactions for Verbal Comprehension, Concept Formation, and Memory for Words. All three interactions revealed a similar pattern. When symptoms of inattention were low, those higher in anxiety performed better on the cognitive task than those low in anxiety. However, when symptoms of inattention were high, those higher in anxiety performed worse on the cognitive task than those lower in anxiety. A similar pattern was seen for Auditory Working Memory, but only for the subset of students with low

symptoms of inattention; in that case, high anxiety was associated with higher performance on the cognitive task than those with low anxiety. This pattern was not evidenced for Visual Matching. On Visual Matching, there was a main effect for inattention, with students who reported fewer symptoms of inattention scoring better on the cognitive task than students with more symptoms of inattention.

The results for symptoms of hyperactivity/impulsivity can be seen in Table 3. There were no interaction effects, and there were no main effects for level of hyperactivity/ impulsivity on any of the cognitive tasks. There were main effects for level of anxiety on Auditory Working Memory and Visual Matching. In both cases, a higher level of anxiety was associated with higher performance on the cognitive task.

Conclusion

College students with ADHD have several kinds of treatment available to them for their symptoms, including medication, academic accommodations, and ADHD coaching. However, these students may also have symptoms of anxiety that may not be appropriately treated by these methods. Thus, it is important to adequately document the nature of anxiety in college students with ADHD. The present study found that, compared with students without an ADHD diagnosis, those with ADHD self-reported significantly more anxiety in a variety of different areas, from symptoms of generalized anxiety to panic attacks to study/ test-taking anxiety. Effect sizes were all medium to large, indicating that the practical significance of these levels of anxiety is substantial. Similar to Nelson and Gregg (2012), we did not find gender differences for any of our anxiety measures. Women, in general, are approximately twice as likely as men to be diagnosed with generalized anxiety

Table 2. Performance on Cognitive Tests as a Function of Anxiety and Inattention.

| Cognitive test | Low inattention | | High inattention | | F | p |
| | Low anxiety | High anxiety | Low anxiety | High anxiety | | |
	M (SD)	M (SD)	M (SD)	M (SD)		
Auditory working memory	102.00 (11.72)	114.55 (10.89)	99.06 (13.11)	101.86 (15.42)	A = 4.4	.04
					I = 4.5	.03
Memory for words	106.72 (11.15)	115.10 (9.45)	105.76 (12.45)	95.50 (13.84)	I = 10.3	.00
					X = 8.47	.00
Verbal comprehension	93.32 (13.86)	99.71 (15.61)	98.22 (12.42)	96.60 (14.16)	X = 3.62	.05
Concept formation	97.28 (12.31)	102.68 (13.48)	105.31 (13.14)	97.08 (14.20)	X = 11.79	.00
Visual matching	92.70 (14.28)	96.55 (15.24)	89.50 (13.55)	90.69 (15.48)	I = 4.08	.04

Note. A = main effect for anxiety; I = main effect for inattention; X = Anxiety × Inattention interaction.

Table 3. Performance on Cognitive Tests as a Function of Anxiety and HI.

| Cognitive test | Low HI | | High HI | | F | P |
| | Low anxiety | High anxiety | Low anxiety | High anxiety | | |
	M (SD)	M (SD)	M (SD)	M (SD)		
Auditory working memory	104.04 (12.14)	112.60 (13.04)	104.69 (15.75)	109.22 (13.40)	A = 4.53	.03
Memory for words	107.04 (13.53)	100.40 (11.40)	104.07 (15.67)	104.34 (12.98)		ns
Verbal comprehension	101.34 (10.17)	104.15 (11.94)	100.55 (11.13)	100.68 (10.64)		ns
Concept formation	102.61 (12.84)	103.81 (10.55)	106.11 (11.77)	103.87 (11.71)		ns
Visual matching	96.25 (15.23)	101.78 (13.28)	95.63 (15.40)	99.32 (13.73)	A = 7.02	.00

Note. HI = Hyperactivity/Impulsivity; A = main effect for anxiety.

disorder and score more highly on self-report scales measuring anxiety (as reviewed by Leach, Christensen, Mackinnon, Windsor, & Butterworth, 2008). Leach et al. (2008) found that the following factors mediated the relationship between gender and anxiety in normal adults: physical activity, perceived levels of mastery, levels of behavioral inhibition, ruminative style, neuroticism, interpersonal problems, and work issues. It is possible that in college students with ADHD, the effects of the ADHD overshadow the effects of these variables, causing the gender differences in anxiety to disappear. Alternately, perhaps many of these variables (e.g., perception of mastery, behavioral inhibition, interpersonal and work-related issues) no longer differentiate males from females within an ADHD sample; therefore, the concomitant anxiety differences are no longer apparent.

Previous research with children who have ADHD has suggested that comorbid anxiety may actually reduce impulsivity (Schatz & Rostain, 2006), with more demonstration of inattentive symptoms rather than impulsivity (March et al., 2000). In our sample of college students, anxiety was equally associated with symptoms of inattention and symptoms of hyperactivity/impulsivity. This may

be due to the fact that, in adults, ADHD is more highly associated with inattention, whereas the hyperactive and impulsive symptoms tend to remit (Prevatt, Walker, Baker, & Taylor, 2010). Therefore, anxiety may not be noticeably impacting impulsivity because symptoms of impulsivity in adults are already reduced.

Past research has suggested that college students with ADHD may be at risk of anxiety because they encounter unique challenges related to school and the college lifestyle, including difficulties with academics, social skills, adaptation to college, and relationships. The present study determined that college students with ADHD do in fact experience significant anxiety. In addition, we determined that regardless of the type of anxiety (generalized anxiety and panic attacks), students reported more symptoms when considering their academic performance than when thinking about their life in general. This is important to consider when intervening with this population. The normal life stresses cannot be ignored; however, this population is additionally stressed by concerns about studying, taking tests, and grades. Previous work (Reaser et al., 2007) found that college students diagnosed with ADHD reported significant

difficulty with specific study skills, including time management, concentration, motivation, anxiety, test taking skills, and study strategies. This implies that at least part of an intervention might be devoted to ADHD coaching, rather than mental health counseling, with more of a focus on changing specific academic behaviors (Parker & Boutelle, 2009). The present study also found that freshmen with ADHD reported less anxiety than upperclassmen. This might be due to the fact that as students move closer to graduation, they become increasingly aware of their future, and are more likely to experience stress due to their future: Will they even graduate? and if so, will they find a job or secure a place in graduate school? Individuals with ADHD are thought to have a variety of deficits with regard to time (Barkley, 2006). It may be that freshmen are not thinking about the future, and in the same way that they procrastinate regarding the term paper due next month, they also fail to think ahead about graduation and beyond. This might even serve as a protective function as it might reduce anxiety about their future. Additional research in this area would need to look specifically at whether our findings regarding year-in-school differences regarding anxiety are related to deficits in time estimation experienced by those with ADHD.

Our findings with regard to the impact of symptoms of inattention on cognitive tests were quite consistent. On three of the subtests (Memory for Words, Verbal Comprehension, and Concept Formation), interactions were found that followed a similar pattern; the interactions all showed that highest performance on the cognitive task was exhibited by students with low inattention and high anxiety. When symptoms of inattention were high, then anxiety was associated with poorer performance on the cognitive task. On a fourth subtest (Auditory Working Memory), this pattern was partially shown, in which highest performance on the cognitive task was exhibited by students with low inattention and high anxiety; however, when inattention was high, anxiety level did not differentiate cognitive performance. Only one subtest (Visual Matching) showed a different pattern, with low inattention consistently related to better performance on the cognitive task than high inattention, regardless of anxiety level. We might conclude that anxiety can act as a protective factor for students with lower levels of inattentiveness. It may be that the anxiety has a positive impact on cognitive performance due to increased motivation (Eysenck, 1992), the energizing and focusing effects of anxiety (Carver & Scheier, 1986), or a self-regulatory mechanism (Cheng, Hardy, & Markland, 2009). The only subtest that did not show the differential effect of anxiety was Visual Matching. This subtest is a fairly pure measure of perceptual speed, and it is possible that the effects of any amount of inattention overshadowed the possible positive impact of heightened anxiety. Future research might attempt to determine the practical ramifications of this finding. What "real life" tasks performed by college students are more impervious to

the motivational or self-regulatory impact of anxiety? Is this determined by the student's beliefs about the importance of the task or their motivation to do well on the task? Further explication of these findings would advance our understanding of the impact of symptoms of inattention on college student performance.

Different results were found for symptoms of hyperactivity/impulsivity. There were no interactions for hyperactivity/impulsivity by anxiety, and no main effects for level of hyperactivity/impulsivity. As noted above, in adults, ADHD is more highly associated with inattention, whereas the hyperactive and impulsive symptoms tend to remit. Therefore, anxiety may not be noticeably impacting impulsivity because symptoms of impulsivity in adults are already reduced.

Implications for Practice

A better understanding of the ways that anxiety can affect college students with ADHD will be useful for college counselors or advisors. The current study suggests that anxiety can take many forms: worrying about tests and studying, general anxiety regarding life, as well as panic attacks with concomitant physical symptoms. Each of these can create added difficulty for students already dealing with issues directly related to ADHD (problems with time management, organization, procrastination, lack of focus). College personnel should address the symptoms of anxiety and ADHD as one interwoven presenting problem, which will require a multifocused approach. Students may need medication for symptom reduction, tutoring or coaching to deal with academic issues, counseling to deal with anxiety and other stressors, as well as mandated accommodations such as extended time to facilitate performing at their full potential. Strategies specifically to deal with anxiety might include relaxation and stress management.

Medication is commonly prescribed to deal with the symptoms of ADHD. Currently, stimulants have the most research support and are considered to be the most effective (Rostain, 2008), with 70% of patients responding to initial treatment (Wigal, 2009). However, stimulants can be contraindicated when the individual has a comorbid disorder, especially mood or anxiety disorders (Mohammadi & Akhondzadeh, 2007). Those working with college students need to carefully assess all aspects of their condition, and guide them to work with their physician or psychiatrist to ensure that medications for ADHD do not exacerbate symptoms of anxiety. Unfortunately, we did not have access to medication status of the participants with ADHD; therefore, we were unable to determine the impact of medication on their performance.

The finding that upperclassmen tend to report more anxiety than freshmen and sophomores might indicate that they have more anxiety regarding graduation and eventual

careers. Due to the fact that adults with ADHD tend to have more career counseling concerns (Painter, Prevatt, & Welles, 2008), it might be prudent to explore career issues whenever working with a college student with ADHD. It is especially important for these students to select a career that matches their unique strengths and weaknesses (Levrini & Prevatt, 2012), and when they are able to determine a consistent career goal, they are more likely to see their courses as relevant and be motivated to perform well.

We found that on several cognitive tasks, better performance was achieved by those with lower symptoms of inattention and higher levels of anxiety. The practical implications of this finding are that one should not automatically assume a negative effect of anxiety in college students with ADHD. In the Clinic with which the authors are affiliated, it is common practice to refer anxious students to counseling to deal with stress reduction or test anxiety. It may be productive to explore the nature of the anxiety, and reassure students that there might be a positive side to their academic concerns. Normalizing their concerns, educating them about anxiety, and even being able to reframe their anxiety as a possible positive coping mechanism may all be helpful strategies.

Declaration of Conflicting Interests

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