

Adjustment to College in Students With ADHD

By: David L. Rabiner, [Arthur D. Anastopoulos](#), Jane Costello, Rick H. Hoyle, H. Scott Swartzwelder

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Abstract:

Objective: To examine college adjustment in students reporting an ADHD diagnosis and the effect of medication treatment on students' adjustment. Method: 1,648 first-semester freshmen attending a public and a private university completed a Web-based survey to examine their adjustment to college. Results: Compared with 200 randomly selected control students, 68 students with ADHD reported more academic concerns and depressive symptoms. This was explained by higher rates of inattentive symptoms among students with ADHD and was unrelated to hyperactive-impulsive symptoms. Among students with ADHD, medication treatment was not related to better adjustment or diminished ADHD symptoms. The contribution of inattention to academic concerns and depressive symptoms remained significant when controlling for personality traits. Conclusion: Students with ADHD experience greater academic performance concerns and depressive symptoms during the transition to college. Medication treatment did not appear to diminish ADHD symptoms nor enhance students' adjustment. (J. of Att. Dis. 2008; 11(6) 689-699)

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Article:

Although children with ADHD are less likely than their peers to graduate from high school and attend college (Barkley, Fischer, Edelbrock, & Smallish, 1990), an increasing number of young adults with ADHD are enrolling in colleges and universities (DuPaul et al., 2001; Wolf, 2001). How do students with ADHD adjust to college life? Does medication treatment for ADHD positively affect the quality of their academic experience or psychosocial adjustment to college life? Are difficulties with adjustment to college specifically related to core ADHD symptoms or to personality characteristics that may be associated with those symptoms? These are all questions about which little is known.

The results of prior studies examining adjustment to college in students with ADHD have been mixed. Heiligenstein, Guenther, Levy, Savino, and Fulwiler (1999) reported on students with high rates of ADHD symptoms who self-referred to a college counseling center; those with

comorbid disorders were excluded. Compared with students seeking assistance for career concerns, students with ADHD had lower grade point averages (GPAs) and were more likely to have been on academic probation. However, differences in self-reported depression, anxiety, interpersonal relationships, physical health, or substance use were not found, perhaps because ADHD students with comorbid disorders were excluded.

In contrast to those findings, students with ADHD attending a commuter campus of a large Catholic university rated themselves as having poorer academic, social, and personal-emotional adjustment to college than did students matched on age, gender, and GPA (Shaw-Zirt, Popali-Lehane, Chaplin, & Bergman, 2005). They also reported lower levels of self-esteem, a finding that has also been reported by Dooling-Litfin and Rosen (1997). Similarly, Grenwald-Mayes (2002) reported that college students with ADHD described a lower quality of life than other students. These were older students, however—older than 24, on average—and thus were not traditional undergraduates. Finally, Kern, Rasmussen, Byrd, and Wittschen (1999) suggest that college students with ADHD may have difficulty obtaining social support from others, which could interfere with their adjustment to college. These authors, however, did not directly examine adjustment to college in students with ADHD and their sample was restricted to students participating in an undergraduate psychology course rather than the wider student body.

It is surprising that these are the only studies published to date on adjustment to college in students with ADHD. In addition to the mixed results reported, the samples in several of these studies are probably not representative of the general population of college students with ADHD, as one was clinic-based and excluded students with comorbid disorders, one dealt with commuter students, and a third involved older, nontraditional college students. Given the paucity of data on how students with ADHD adjust to college life, and the equivocal findings from these data, an important goal of this study was to examine college adjustment in a more representative sample of students with ADHD.

Because there is an extensive literature documenting the adverse effect that ADHD has on academic, social, and psychological functioning (Barkley, 2006), there is certainly a basis for hypothesizing that students with self-reported ADHD would report more academic concerns, reduced satisfaction with their social life, higher levels of depressive symptoms, and higher rates of substance use (Molina & Pelham, 2003). On the other hand, college students with ADHD are likely to be a better adjusted subset of the general ADHD population and have experienced a significant measure of academic success. Thus, we viewed it as quite possible that they would not show the same pattern of difficulties that characterize the general population of individuals with ADHD.

A second issue we examined was the relationship between medication treatment and students' adjustment to college. There is ample evidence that stimulant medications are effective treatments for adolescents and young adults with ADHD (Greenhill, 2002), suggesting that medication treatment would promote a more successful college transition. However, treatment outcomes obtained in community settings often fall short of what occurs in clinical trials (MTA Cooperative Group, 1999), and college places increased organizational and time management demands on students, who must cope with these demands without the support that was previously provided by parents and teachers who knew them well. We were thus uncertain whether medication treatment would be associated with a more positive transition to college for students with ADHD and are not aware of any prior studies in which this issue has been examined.

The final issue we explored was the relative contribution of ADHD symptoms and personality characteristics to students' adjustment. Recently, Nigg et al. (2002) examined the association between ADHD symptoms and the Big Five personality traits (i.e., extraversion, agreeableness, conscientiousness, emotional stability, and openness to experiences; McCrae & Costa, 1999) among young adults and found that low conscientiousness and high neuroticism were associated with inattentive symptoms, whereas low agreeableness was associated with hyperactive-impulsive symptoms. Because particular Big Five traits are also related to various indices of psychosocial adjustment in young adults, including substance use (Flory, Lynam, Milich, Leukefeld, & Clayton, 2002), internalizing symptoms (Flory et al., 2002), academic success in college (Komarraju & Karau, 2005; Ridgell & Lounsbury, 2004), and perceived quality of social relationships in college (Lopes, Salovey, & Strauss, 2003), it is important to test whether ADHD symptoms predict college adjustment after the association between personality traits and adjustment is controlled for.

We examined these issues using data collected as part of a longitudinal study on the nonmedical use and abuse of ADHD medications among students attending either a private or public university in the southeast United States. As part of the initial wave of data collection, which occurred roughly 10 weeks into students' first semester of college, students were asked whether they were currently diagnosed with ADHD, as well as a variety of questions pertaining to their psychosocial adjustment. Because the larger study required students to report on illegal behaviors, all responses were provided anonymously. This precluded us from being able to independently document the validity of students' self-reported diagnostic status for ADHD.

Methods

Participants

Participants were 1,648 freshmen from a public and a private university located in the southeastern United States who completed the Web-based survey described below; the Institutional Review Board at both universities approved the protocol for this study and all participating students provided informed consent. The public university serves predominantly in-state students and has a female-to-male ratio of more than 2 to 1. The private university is highly selective, admits a more geographically diverse student body, and the female-to-male ratio is nearly equal. Details on the participation rate and demographic characteristics of the sample are provided below.

Measures

The survey administered to students was intended to build on current knowledge pertaining to the nonmedical use and misuse of ADHD medications among college students. Thus, students who reported using ADHD medication without a prescription or misusing prescribed ADHD medication were asked a number of questions about these behaviors, and results pertaining to that aspect of the study will be reported elsewhere. Below, we focus on items that directly address college adjustment in students with ADHD.

ADHD status. Participants were asked whether they were currently diagnosed with ADHD and classified based on their response. As noted above, because the survey was

completely anonymous, the accuracy of students' self-report diagnostic status could not be independently verified via diagnostic interview. We did not ask whether participants were diagnosed with the inattentive, hyperactive-impulsive, or combined subtype of ADHD because we believed that most students would not be aware of this information, even if a particular subtype had been assigned by the diagnosing clinician.

ADHD symptoms. Because ADHD symptoms in the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text revision; DSM-IV-TR) (American Psychiatric Association, 1994) may not adequately capture manifestations of ADHD in young adults (Barkley, Fischer, Smallish, & Fletcher, 2002), we developed items to measure inattentive and hyperactive-impulsive symptoms that were directly relevant to college students. The six-item inattention scale included items inquiring about attention difficulties related to college academic tasks, for example, "It is difficult for me to pay attention during classes," "I believe that most students in my courses concentrate better in class than I do," and "I have difficulty keeping track of my different school assignments." Students responded on 5-point scales anchored by *strongly disagree* and *strongly agree*; item responses were averaged so that higher scores indicate greater self-reported attention difficulties. Coefficient alpha for the scale exceeded .90. The complete list of items included on this scale can be found in the Appendix.

Hyperactive-impulsive symptoms were assessed with five items selected to reflect the manifestation of such difficulties in college students, for example, "I feel restless and fidgety during my classes," "I feel restless and fidgety when completing schoolwork outside of class," and "I am an impulsive person." As above, students indicated responses ranging from *strongly disagree* to *strongly agree*, and item responses were averaged so that higher scores indicate greater self-reported attention difficulties. Coefficient alpha for the scale was .84.

Personality factors. Information on personality traits was assessed using the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003). The TIPI includes two items for each of the Big Five personality trait domains: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experiences. Each item is a pair of adjectives drawn from extant adjectival measures of the five-factor model. One pair in each set represents the negative pole and the other the positive pole of the personality domain; the negatively worded item was reverse scored and the two items were summed. Two-week test-retest coefficients are in the mid .70s. Scores on the five factors correlate highly with their counterparts on the Big Five Inventory (44 items) and the Revised NEO Personality Inventory (NEO-PI-R) (240 items). Convergent and discriminant validity of the TIPI scores are acceptable (Gosling et al., 2003). Although a more comprehensive assessment of the Big Five traits would have been preferable, this short instrument was selected so that the time to complete the survey for students who responded to questions pertaining to medication abuse and misuse would remain reasonable.

Academic concerns. This four-item scale assessed students' concerns about their early academic performance and ability to succeed academically. Two items were framed positively, for example, "I feel satisfied with how well I am doing academically," and two were framed negatively, for example, "I worry that my grades will not be as good as I need them to be." Students responded to each item on a 5-point strongly disagree to strongly agree scale based on

their feelings for the past 30 days. Positively worded items were reverse scored and the four items were averaged so that higher scores reflect greater academic concerns. Coefficient alpha for the scale was adequate at .76.

Social dissatisfaction. Four items were created to assess students' satisfaction with their friendships and social life. Two items were framed positively, for example, "I feel satisfied with the quality of my social life in college," and two were framed negatively, for example, "I feel lonely." Students responded to each item on a scale anchored by *strongly disagree* and *strongly agree* based on their feelings for the past 30 days. Positive items were reverse scored and the four items were averaged so that higher scores reflect greater dissatisfaction. Coefficient alpha for the scale was adequate at .76.

Depressive symptoms. Depressive symptoms were assessed using an eight-item scale derived from the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). Students were asked how often during the past 2 weeks they had experienced a variety of depressive symptoms, for example, "felt sad, blue, unhappy or down in the dumps," and "felt that you were not enjoying the activities you used to," and responded on 5-point scales ranging from never to most of the time. Responses averaged such that a higher score reflects greater endorsement of depressive symptoms. Coefficient alpha for the scale was .89.

Alcohol, tobacco, and drug use. Two questions were asked about alcohol use. First, students were asked, "On how many occasions (if any) have you had alcohol to drink (more than just a few sips) during the PAST 6 MONTHS?" Consistent with national research, the response scale was (1) *never*, (2) *1–2 occasions*, (3) *3–5 occasions*, (4) *6–9 occasions*, (5) *10–19 occasions*, (6) *20–39 occasions*, and (7) *40+ occasions*. Students were also asked, "What is the greatest number of drinks you consumed within a 2-hour period during the past 30 days? By a drink, we mean half an ounce of absolute alcohol (e.g., a 12-ounce can or glass of beer or cooler, a 5-ounce glass of wine, or a drink containing 1 shot of liquor)." Students who had consumed any alcohol in the past 30 days were instructed to enter 0.

For drug use, students were asked about their use of marijuana, cocaine, and a variety of other substances over the past 6 months and responded using the same response scale as for alcohol. Finally, students were asked how many cigarettes they had smoked in the past 30 days and responded on a 7-point scale ranging from *none* to *more than 2 packs per day*.

Procedure

The study was conducted over a 5-week period beginning roughly 9 weeks into the students' first semester. All freshmen older than 18 at the private ($n = 1,572$) and public ($n = 2,033$) universities were sent a letter informing them about a Web-based survey that was being conducted to learn about the possible misuse and abuse of ADHD medications by college students. Several days later, students received an e-mail invitation that explained how to access the survey. Students were assured that their responses would remain confidential, that the researchers would not be able to link individual students with their responses (students accessed the survey using a randomly generated ID number), and that a Certificate of Confidentiality to protect their privacy had been obtained. A \$10 campus bookstore gift card was offered as an incentive to participate and students were informed that they would also be eligible to win one of

10 \$100 bookstore gift cards at each campus. Students who neither responded nor opted out were sent up to three additional requests to complete the survey at weekly intervals. Surveys were submitted by 803 students from the private university (51% participation rate) and 845 students from the public university (42% participation rate). Across the two schools, the participation rate was 46%; this figure is consistent with other college-based studies on this topic (Teter, McCabe, Cranford, Boyd, & Guthrie, 2005).

Results

Sample Characteristics

The final sample included the 1,648 members of the freshman class at the two universities who completed and submitted the survey. Table 1 shows the demographic characteristics of our sample; the percentages shown are highly similar to the population of freshmen at each university.

Sixty-eight students—approximately 4% of those who participated—reported that they were currently diagnosed with ADHD. Forty-nine of these students were from the public university (5.8% of participants) and 18 were from the private university (2.2% of participants); 44 (65%) were female, and 62 (91%) were Caucasian. The high percentage of females in the ADHD sample reflects the fact that the reported rate of ADHD at the public university was more than double the rate at the private university (i.e., 5.8% vs. 2.2%), and females made up 79% of the public university sample; among the students who responded, however, approximately 4% of males and females identified themselves as having ADHD. In addition to the 68 students who reported a current ADHD diagnosis, 19 students indicated that although they were not currently diagnosed with ADHD, they had been previously diagnosed with ADHD by a health professional. We felt it would be interesting to compare college adjustment in students previously diagnosed with those currently diagnosed and decided to include this group in several of the analyses reported below.

Because of the large imbalance in group size between students identifying themselves as having or not having ADHD, we identified a sample of 100 students from each site who had no reported history of either ADHD or ADHD medication use; these students were randomly selected from within gender and race groupings to match the composition of sex and race observed for the population of participants at each site. Groups were compared using analyses of variance with gender, race, and site included as covariates; when group differences were significant, pairwise t tests that controlled for multiple comparisons were conducted. Although we had no specific predictions for whether group differences would be moderated by gender or site, these interactions were tested to ascertain whether any group effects that emerged were consistent for males and females as well as for students attending different types of universities.

Table 1. Percentage Distributions of Sample/Population Characteristics

Characteristic	Private	Public	Total Sample
	<i>n</i> = 803	<i>n</i> = 845	<i>n</i> = 1648
Male	49	22	35
Female	51	79	65
White	68	78	70
African American	6	16	11
Asian	21	2	10
Hispanic	5	3	4

Note: Entries indicates the percentage of participants in each demographic group

Inattentive and Hyperactive-Impulsive Symptoms

Because group assignment was based entirely on students' report, we first examined whether the students' self-reported inattentive and hyperactive-impulsive symptoms were consistent with their self-reported diagnostic status. Results from this analysis can be seen in the upper portion of Table 2.

As expected, compared with those in the representative sample, students currently diagnosed with ADHD reported significantly higher rates of inattention and hyperactivity-impulsivity; the effect size for these differences was large in both cases. Students with ADHD also tended to report higher rates of attention difficulties than students who were previously diagnosed, but this difference was only marginally significant (i.e., $p < .07$). Students who were previously diagnosed with ADHD also reported higher rates of inattentive and hyperactive-impulsive symptoms than students in the representative sample. Interactions of group with gender and site did not approach significance.

Table 2. Group Means and Standard Deviations (in parentheses) for ADHD Symptoms, Academic Concerns, Depressive Symptoms, and Social Satisfaction

Outcome	Current ADHD	Prior ADHD	Never ADHD	<i>d</i>
	<i>n</i> = 68	<i>n</i> = 19	<i>n</i> = 200	
Inattention	3.35 ^a (1.19)	3.18 ^a (1.05)	2.36 ^b (.96)	.96
Hyperactivity	3.27 ^a (.80)	3.27 ^a (.88)	2.47 ^b (.74)	.92
Academic	2.60 ^a (.99)	2.75 ^b (.87)	3.06 ^b (.96)	.48
Depression	2.80 ^a (.85)	3.07 ^a (.98)	2.49 ^b (.85)	.37
Social	3.82 ^a (.83)	3.92 ^a (1.04)	3.86 ^a (.87)	—

Note: Within each row, means that share a superscript do not significantly differ, $p < .01$. The final column, *d*, represents the effect size of the difference between the Current ADHD and Never ADHD groups

College Adjustment in Students With ADHD

The mean ratings for academic concerns, depressive symptoms, and social satisfaction are also shown in Table 2. Compared with the representative sample of students, those currently diagnosed with ADHD reported more concerns about their academic performance as well as higher rates of depressive symptoms; the effect size would be considered small to moderate. For depressive symptoms, the group effect was qualified by a significant Group \times Site interaction. This interaction reflected the fact that although mean depressive symptoms were substantially higher in the public university students with ADHD than in students from the representative sample (3.17 vs. 2.50), this was not the case for students attending the private university (2.28 vs. 2.50). Although students previously diagnosed with ADHD appeared to report greater academic concerns than students who were never diagnosed, this difference was not significant. They did, however, report higher levels of depressive symptoms. Students' report of their social satisfaction was comparable for all groups.

Alcohol, Drug, and Cigarette Use

A series of logistic regression analyses was conducted to determine whether students with ADHD were more likely than peers to drink, smoke, or use marijuana. Although students were also asked about the use of other substances such as cocaine, ecstasy, inhalants, and so on, the small number of students reporting use of the substances precluded statistical analysis. As with the other adjustment measures, gender, site, and race were included as predictors in the model.

Students with either current or past ADHD were not more likely than others to report consuming alcohol during the past 6 months, and among those who reported drinking in the past 30 days, the maximum number of drinks consumed during a 2-hour period was highly similar across groups. The percentage of students in each group reporting marijuana use was also highly similar. Students with current and prior ADHD were, however, between 2.5 and 3.5 times as likely to have smoked cigarettes during the past 30 days.

Does Medication Treatment Enhance Adjustment in Students with ADHD?

Of the 68 students reporting a current ADHD diagnosis, 47 indicated that they were being treated with medication, whereas 21 reported no current medication treatment. To determine whether medication treatment was associated with better adjustment, we compared these groups on their academic concerns, depressive symptoms, and social satisfaction; we also tested for group differences in inattentive and hyperactive-impulsive symptoms, for which medication treatment would be most expected to be helpful. As above, gender, site, and race were included as control variables. The results of these comparisons are shown in Table 3, where it is evident that the reports of students in each group were remarkably consistent, and none of the differences approached significance. We also examined whether medication treatment was associated with the likelihood of consuming alcohol, marijuana, or cocaine during the prior 6 months or of smoking cigarettes in the past 30 days. The only difference to approach significance was that students who reported having ADHD and being treated with medication tended to be more likely to have used marijuana in the prior 6 months (36% vs. 19%; $X^2 = 2.77$, $p < .10$).

Table 3 Means and Standard Deviations (in parentheses) Difference for ADHD Symptoms, Academic Concerns, Depressive Symptoms, and Social Satisfaction for Students With ADHD Based on Medication Treatment Status

Outcome	Medication Treatment	No Medication Treatment
	<i>n</i> = 46	<i>n</i> = 21
Inattention	3.32 (1.14)	3.39 (1.32)
Hyperactivity	3.06 (.88)	3.34 (0.97)
Academics	2.60 (1.04)	2.68 (0.97)
Depression	2.88 (0.91)	3.06 (0.73)
Social	3.93 (0.85)	3.55 (0.77)

Note: Means could range from 1 to 5, with higher values indicating more of the outcome

The Contribution of ADHD Symptoms and Personality Traits to College Students' Adjustment

As noted above, Nigg et al. (2002) recently demonstrated that ADHD symptoms are associated with several Big Five personality domains, which in turn are known to be related to several indices of adjustment in young adults (Axelrod, Widiger, Trull, & Corbitt, 1997; Blais, 1997; Flory et al., 2002; Komarraju & Karau, 2005; Lopes et al., 2003; Ridgell & Lounsbury, 2004). Thus, we felt it would be important to examine whether ADHD symptoms contribute to students' adjustment after controlling for differences related to personality domains.

Prior to examining this question, we sought to replicate Nigg et al.'s (2002) findings pertaining to the relationship between ADHD symptoms and Big Five personality domains. The correlation between these variables is presented in Table 4, which also presents the relationship between personality traits and the adjustment measures we examined. Although these analyses relied on dimensional scores for ADHD symptoms rather than discrete categories, we used the same representative sample rather than including all participants, to be consistent with analyses reported above.

As seen in Table 4, small to moderate correlations with the personality domains were found for both inattentive and hyperactive-impulsive symptoms. Consistent with Nigg et al.'s (2002) report, inattentive symptoms showed a moderate negative correlation with conscientiousness and smaller negative associations with both emotional stability and agreeableness, whereas hyperactive-impulsive symptoms were negatively correlated with conscientiousness and agreeableness. Unlike their report, modest but significant associations between hyperactive-impulsive symptoms and the remaining Big Five traits were also evident. As can be seen, there were also a number of significant correlations between personality domains and the different adjustment measures. Of note is that conscientiousness and emotional stability showed a moderate and significant negative correlation with all three adjustment measures. Relationships between the other Big Five domains and the adjustment outcomes were also found but were less consistent and generally smaller in magnitude.

To test whether ADHD symptoms contributed to students' adjustment after controlling for personality characteristics, we conducted a series of hierarchical multiple regressions in which gender, race, and site were entered as the first step, personality trait scores were entered as the second step, and inattentive and hyperactive-impulsive symptoms were entered as the final step. All independent variables were mean-centered before they were entered into the regressions and cases with missing values were excluded. Results of these analyses are presented in Tables 5 through 7.

Table 4 Correlation Between Personality Traits, ADHD Symptoms, and Adjustment Outcomes

	Inattentive	Hyper	Academics	Depressed	Social
Openness	.10	.18	-.07	.06	-.20
Emotional stability	-.28	-.21	-.34	-.52	-.48
Conscientiousness	-.49	-.48	-.40	-.31	-.28
Agreeableness	-.16	-.25	-.13	-.15	-.21
Extraversion	.10	.18	.01	.08	-.25

Note: *N*s range from 316 to 331. Correlations of magnitude greater than or equal to .11 are significant, $p < .05$

As seen in Table 5, students' academic concerns were unrelated to gender, site, and race but were negatively related to both conscientiousness and emotional stability. Inattentive symptoms remained a significant predictor of academic concerns even after controlling for personality factors, and an increase of 1 standard deviation in inattentive symptoms was associated with a nearly .50 standard deviation increase in academic concerns.

Table 5 Summary of Hierarchical Regression Analysis for Variables Predicting Students' Academic Concerns ($N = 248$)

Variable	<i>B</i>	<i>SE B</i>	Standardized <i>B</i>
Step 1			
Site	.02	.11	.01
Gender	.00	.11	.00
Black vs. White	-.24	.17	-.07
Other vs. White	.00	.16	.00
Step 2			
Extraversion	.00	.04	.00
Agreeableness	-.06	.05	-.07
Conscientiousness	-.16	.04	-.24***
Emotional stability	-.15	.04	-.22***
Openness	.05	.05	.05
Step 3			
Inattentive	.43	.07	.49***
Hyperactivity	.12	.09	.12

Note: $R^2 = .06$ for Step 1; $\Delta R^2 = .31$ for Step 2 ($p < .001$); $\Delta R^2 = .12$ for Step 3 ($p < .001$).
*** $p < .001$.

Results pertaining to depressive symptoms are presented in Table 6. Females reported higher rates of depressive symptoms than males, and among the Big Five traits, emotional stability and extraversion were negatively related to self-reported depression. Once again, however, inattentive symptoms remained a significant predictor of depressive symptoms after personality factors were controlled for.

Table 6 Summary of Hierarchical Regression Analysis for Variables Predicting Students' Depressive Symptoms ($N = 248$)

Variable	<i>B</i>	SE <i>B</i>	Standardized <i>B</i>
Step 1			
Site	.08	.09	.09
Gender	-.28	.09	-.15**
Black vs. White	.13	.14	.04
Other vs. White	.16	.14	.04
Step 2			
Extraversion	-.06	.03	-.10*
Agreeableness	.02	.04	.02
Conscientiousness	.00	.04	.00
Emotional stability	-.23	.04	-.37***
Openness	-.01	.04	.00
Step 3			
Inattentive	.33	.06	.42***
Hyperactivity	.04	.07	.04

Note: $R^2 = .05$ for Step 1; $\Delta R^2 = .30$ for Step 2 ($ps < .001$); $\Delta R^2 = .14$ for Step 3 ($ps < .001$).

* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 7 presents results for students' reports of social dissatisfaction. Social dissatisfaction was not related to any of the demographic variables and was negatively related to extraversion, conscientiousness, and emotional stability. In contrast to results for both academic concerns and depressive symptoms, the association with attention problems was not significant.

Table 7 Summary of Hierarchical Regression Analysis for Variables Predicting Students' Social Dissatisfaction ($N = 248$)

Variable	<i>B</i>	SE <i>B</i>	Standardized <i>B</i>
Step 1			
Site	.07	.10	.04
Gender	.03	.10	.01
Black vs. White	-.09	.16	-.03
Other vs. White	.14	.15	.05
Step 2			
Extraversion	-.13	.03	-.23***
Agreeableness	-.02	.05	-.02
Conscientiousness	-.10	.04	-.16**
Emotional stability	-.23	.04	-.39***
Openness	-.02	.04	.03
Step 3			
Inattentive	.03	.08	.05
Hyperactivity	.05	.07	.04

Note: $R^2 = .06$ for Step 1 ($ps > .10$); $\Delta R^2 = .32$ for Step 2 ($ps < .001$); $\Delta R^2 = .00$ for Step 3 ($ps > .10$).

Discussion

Results from this study suggest that the association between ADHD and college students' adjustment depends on the adjustment domain being considered and the characteristics of students who attend different institutions. We found no indication that students with self-reported ADHD experienced less satisfaction with their social lives during their initial semester in college or that they were more likely to use alcohol or marijuana. They were, however, more than twice as likely to smoke cigarettes; this is consistent with recent findings on the relationship between ADHD and smoking (Kollins, McClernon, & Fuemmeler, 2005).

Our findings clearly indicate that even when individuals with ADHD have achieved sufficient academic success to enroll in college, including a highly competitive institution such as the private university in this study, they still experience greater concerns about academic performance during their initial semester than their peers. Because we plan to survey these students again during the latter part of their sophomore year, it will be interesting to learn whether these concerns change over time and how academic concerns and ADHD status relate to students' actual academic performance. It will also be interesting to examine whether differences in social satisfaction and substance use in students with and without ADHD emerge over time.

Results pertaining to self-reported depressive symptoms were more complex in that modestly elevated rates of depressive symptoms were evident in students with ADHD who attended the public but not in those who attended the private university. The magnitude of this difference was striking, as the average depression score for the private university students with ADHD was more than a standard deviation below that for the public university students with ADHD. Because gender was included as a covariate in all analyses, the higher depression scores in the latter students with self-reported ADHD cannot be explained by the higher proportion of females in this sample. One possible explanation is that because ADHD adversely affects students' academic performance, students with ADHD are less likely to gain admission to more competitive schools, and those who do gain admission have a history of accomplishment that protects against depressive symptoms. Our data are consistent with this possibility, in that the rate of self-reported ADHD in the public university sample was more than 2.5 times the rate found for the private university. This is clearly speculative hypotheses, however, and it will be important to replicate this result before placing too much stock in this unanticipated finding. It will also be important to see whether the difference in depressive symptoms found among students with ADHD at the two schools persists over time.

The absence of any discernible benefit of medication treatment for students with ADHD was also interesting, and students receiving medication treatment for ADHD did not significantly differ from nonmedicated students on any of the dimensions that we considered, including core ADHD symptoms. Given that controlled studies have clearly demonstrated the efficacy of ADHD medication treatment in adolescents and adults (Greydanus, Sloane, & Rappley, 2002; Wilens, 2003), it is interesting to consider why such benefits were not evident in our sample.

One possibility is that the power for these comparisons was limited by our relatively small sample of treated ($n = 47$) and nontreated ($n = 21$) students; in fact, our power to detect what would be considered a moderate effect size of .5 was only about .60. However, the mean difference between groups was frequently quite small—for inattentive symptoms and academic concerns, it was less than .10 standard deviation, and there was not a single variable on which the groups differed by more than .30 standard deviations in favor of treated students. Thus, we don't

believe that limited power alone provides a strong explanation for why we failed to detect significant differences on the variables that we considered.

What else might explain our failure to detect benefits associated with medication treatment? It is possible that students treated with medication had more severe ADHD to begin with, which could explain why they were not doing better than nontreated students, even though they may have been benefiting from the medication. It is also possible that treated students were not fully complying with their prescription, for example, not taking it as regularly as they were supposed to. Failing to comply with their prescribed medication regimen would be expected to diminish any benefits that were provided, and we did not specifically ask for this information.

Another important possibility to consider, however, is that the transition to college may be an especially difficult one for students with ADHD and that medication effects may be attenuated in comparison to what is seen in younger students. Relative to what most students would have experienced in high school, the typical college freshman has substantially increased amounts of unstructured time and confronts a new set of academic demands where the steps to success are likely to be less straightforward. This places a premium on executive and organizational skills that may pose particular challenges for students with ADHD who are confronting this new set of challenges without the structure and support that parents and high school teachers may have provided. In this environment, medication effects may be less robust, and particularly careful treatment monitoring may be needed for students to derive significant benefit.

Regardless of the reason for the apparent absence of medication benefits, to our knowledge, there are no prior studies in which the effectiveness of ADHD medication treatment in college student populations has been examined, and this is an unfortunate gap in the literature. Our data suggest that, at least as typically provided, medication treatment may provide little benefit to students with ADHD and that controlled studies to determine the benefit of such treatment in college populations is warranted.

In our final analyses, we examined the relative contribution of ADHD symptoms and Big Five personality domains to students' college adjustment. As reported by Nigg et al. (2002), we found that inattentive symptoms were negatively correlated with conscientiousness, emotional stability, and agreeableness, whereas hyperactive-impulsive symptoms were negatively correlated with conscientiousness and agreeableness. Of particular interest, however, were findings that inattentive symptoms remained significant predictors of academic concerns and depressive symptoms even after personality characteristics were controlled for. Given the influence that being able to sustain attention in class and while studying is likely to have on students' academic success in college, it is not surprising that attention difficulties would be a particularly important contributor to making a successful college transition. In subsequent work with this sample, we plan on examining the predictive value of early perceived attention difficulties on students' actual academic performance as well as change in depressive symptoms over time.

It is worth noting that whereas attention difficulties were associated with academic concerns across both universities, and with depressive symptoms among the public university students, hyperactive-impulsive symptoms were not related to any of the adjustment outcomes that we considered. This may reflect the fact that the hyperactive-impulsive symptoms of ADHD tend to dissipate over time to a greater extent than do inattentive symptoms (Biederman, Mick, & Faraone, 2000). It appears from our data that although the hyperactive-impulsive symptoms of ADHD may be particularly relevant for understanding the development of significant antisocial

behavior (Babinski, Hartsough, & Lambert, 1999), these symptoms are less important to understanding the types of adjustment difficulties that are more relevant in college student populations. Whether hyperactive-impulsive symptoms contribute to difficulties that emerge during the course of college remains to be seen.

This study has several limitations that are important to acknowledge. In particular, given the anonymous Web-based survey methodology that we employed, ADHD status was determined solely by students' self-report and we had no way to verify the accuracy of this information. Although students identifying themselves as having ADHD reported elevated rates of inattentive and hyperactive-impulsive symptoms that were consistent with their self-reported diagnosis, it is highly likely that some of these students were misdiagnosed. It is also likely that a number of students did not self-identify as having ADHD, not because they did not actually have the disorder but because they were never formally evaluated or diagnosed. In subsequent work on this issue, it would thus be important to confirm students' self-reported diagnostic status using a structured psychiatric interview as well as standardized rating scales for ADHD in young adults. It would also be important to ascertain which subtype of ADHD students met criteria for, so that the relationship between ADHD subtype and adjustment in college could be examined.

We should also note that many of the scales used were developed specifically for this study (i.e., ADHD symptoms, academic concerns, social dissatisfaction), and their psychometric properties were thus not previously established. The items have face validity for the constructs they intended to measure, however, and the internal consistency of these various scales was acceptable. Although the scale used to assess personality traits, the TIPI (Gosling et al., 2003), has been used extensively in prior research, the use of only two items to assess each of the Big Five personality traits is not ideal and measurement error in these traits may have attenuated their relationship to the adjustment outcomes that we considered. A number of relationships between personality traits and adjustment outcomes was found, however. In addition, we largely replicated prior findings by Nigg et al. (2002) on the association between ADHD symptoms and personality traits among college students.

Finally, there are a number of issues with our sample that raises cautions about the generalizability of our results. First, we surveyed only freshmen, and the degree to which the findings reported would generalize to upperclassmen with ADHD is unknown. Also, although students from a private and a public university were surveyed, our sample is hardly representative of the general population of college/university students. The interaction we found between diagnostic status and site for self-reported depressive symptoms highlights that the relationship between ADHD and particular outcomes can vary across schools, and a more thorough examination of adjustment in college students with ADHD would require a much broader cross section of schools. Finally, our response rate of approximately 46%—although consistent with other survey studies of college students—raises questions about the representativeness of our sample at participating schools. Among our students with ADHD, there is no way to determine how representative they are of the ADHD student population at these schools or what proportion of this population they represent.

These limitations notwithstanding, our results contribute to current knowledge of adjustment to college in students with ADHD in several ways. Our data suggest that at least during their initial semester, students with ADHD are not experiencing greater social difficulties nor are they more likely to use alcohol or marijuana. They are, however, more worried about their academic performance, more likely to be smokers, and at some schools, experiencing higher rates of depressive symptoms. It appears that inattentive symptoms are more strongly

associated with initial college adjustment than are hyperactive-impulsive symptoms and that attention difficulties contribute to initial adjustment difficulties independent of problematic personality traits. Of particular note is that we found no evidence that medication treatment was associated with better adjustment in any domain, nor with lower levels of ADHD symptoms. In subsequent work with this sample, it will be interesting to track the association between ADHD and college adjustment over time and whether this relationship is moderated in any way by medication treatment.

Appendix: College Student ADHD Symptom Scale

Inattentive Items

It is difficult for me to pay attention during classes.

It is difficult for me to concentrate on my academic work.

Concentration difficulties keep me from doing as well academically as I am capable of.

I believe that most students in my courses concentrate better in class than I do.

I believe that most students in my courses can focus on their studies for longer than I can.

I have difficulty keeping track of my different school assignments.

Hyperactive-Impulsive Items

I feel restless and “fidgety” during my classes.

I feel restless and “fidgety” when completing schoolwork outside of class.

I often do things on impulse.

I am an impulsive person.

I very seldom spend much time on the details of planning ahead

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