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First Year GPA and Academic Service Use Among College Students With and Without ADHD

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First Year GPA and Academic Service Use Among College Students With and Without ADHD

Matthew J. Gormley

Lehigh University

Dissertation Proposal Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

School Psychology

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Dissertation Signature Page

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Abstract

ADHD is a chronic neurodevelopmental disorder characterized by significant impairments in attention and behavioral inhibition typically resulting in academic difficulties that persist into college (Weyandt & DuPaul, 2013). Although most colleges offer support services, students often do not utilize the services they are entitled to or have available to them (Chew et al., 2009). The current study is the first to examine differences in GPA using a rigorously defined, multi-site sample. Second, the current study seeks to identify the predictors of academic performance specifically among college students with ADHD. Third, this study provides data regarding how often students with ADHD utilize academic support services. Finally, the current study investigates the academic outcomes of service use among students with and without ADHD during their first year at a four-year college. Results demonstrated significantly lower GPAs among a rigorously defined, multi-site sample of first year college students with ADHD relative to students without ADHD. Second, this study indicated that traditional predictors of college success may be less meaningful for students with ADHD. Third, ADHD combined with other disorders, but not ADHD alone, predicted higher rates of service use relative to students without ADHD. Finally, the present results suggest that typically available academic services are not independently related to GPA among first-year college students with or without ADHD.

Chapter I

Introduction

First Year GPA and Academic Service Use Among College Students With and Without ADHD

Although attention-deficit/hyperactivity disorder (ADHD) has been considered a childhood disorder that remits over time, the preponderance of evidence suggests that the majority of individuals diagnosed with ADHD continue to display functional impairments through adolescence and into adulthood, with 2–5% of adults meeting diagnostic criteria for the disorder (American Psychiatric Association [APA], 2013; Barkley, Murphy, & Fischer, 2008; Biederman, Petty, Clarke, Lomedico & Faraone, 2011; Simon, Czobor, Balint, Meszaros, & Bitter, 2009). Across the lifespan, ADHD has been associated with behavioral, social, vocational, and academic difficulties (APA, 2013; Barkley, 2015; Barkley et al., 2008; DuPaul & Stoner, 2014). With regard to secondary and post-secondary education, students with ADHD have been found to have significantly lower grade point averages (GPAs), lower class placement, and higher levels of course failure relative to their peers (Kent et al., 2011). Further, secondary school students with ADHD are more likely to be retained, suspended or expelled relative to non-affected peers (Barkley et al., 2008; Galera et al., 2009). Importantly, those with ADHD have been found to be eight times as likely to drop out of high school relative to typically developing peers, with up to 40% of students with ADHD dropping out of high school or delaying high school graduation (Barkley, Fischer, Smallish, & Fletcher, 2006; Kent et al., 2011; Wolf, Simkowitz, & Carlson, 2009).

Although empirical literature is limited, it appears that academic difficulties in high school have resulted in lower rates of college attendance among students with ADHD. In a follow-up analysis of a prospective longitudinal study, Kuriyan and colleagues (2013) found that

students with ADHD exhibited lower academic achievement relative to typically-developing peers. Further, the authors reported that high school academic achievement predicted college enrollment and academic problems in college. With regard to college enrollment, approximately 73% of students with ADHD pursued any post-secondary education relative to 95.1% of those without ADHD. Further, only 29.5% of students with ADHD enrolled in four-year institutions relative to 76.8% of students in the comparison group. These four-year data are similar to those reported previously. Specifically, Barkley and colleagues (2006) found that only 21% of individuals with ADHD attended college relative to 78% for a comparison group. Research indicates that students with ADHD make up 5.9% of incoming first year students participating in the Cooperative Institutional Research Program Freshman Survey (Eagan et al., 2014).

It has been reported that up to 47% of students with any disability will drop out of college within the first four years of attendance (Horn & Berkold, 1999). Within this period, it appears that the first year of college is of particular importance given that approximately 57% of students who drop out do so prior to their second year (Tinto, 1996). This relatively low retention rate has significant societal costs in the form of lost income and revenue. Specifically, Schneider and Yin (2011) concluded that students who failed to graduate from college within six years cost the nation \$3.8 billion in lost income, \$566 million in lost federal income taxes and \$164 million in lost state taxes.

In addition to the larger societal costs, the limited college enrollment among students with ADHD is concerning given the relationship between educational attainment and lifetime earnings on the one hand, as well as the correlation between income and subjective well-being on the other (Carnevale, Rose & Cheah, 2013; Diener, Sandvik, Seidlitz, & Diener, 1993). Specifically, Diener and colleagues reported that annual income was positively correlated with

ratings of subjective well-being across gender, educational level and racial groups. Further, the relationship between income and subjective well-being extended to higher-earning strata suggesting the effect is not based on financial ability to meet one's basic needs. Additionally, Carnevale and colleagues reported that those who do not complete high school have lifetime earnings (\$973,000) equaling only 75% of the lifetime earnings of those who complete high school (\$1,304,000). Similarly, those with a high school diploma accumulate approximately 75% of the lifetime earnings of those with an associate degree (\$1,727,000) and approximately 57% of the lifetime earnings of those with a bachelor's degree (\$2,268,000). Therefore, the lower college attendance and college success displayed by individuals with ADHD indicates a trajectory toward lower socioeconomic status and subsequently, lower subjective well-being.

Among college students, high self-ratings of ADHD symptomology or a self-reported diagnosis of ADHD has been correlated with lower GPAs, more academic difficulties, and fewer effective study skills (Advokat, Lane, & Luo, 2011; Blase et al., 2009; Lewandowski, Lovett, Coddling & Gordon, 2008; Norwalk, Norvilitis, & MacLean, 2009; see Weyandt & DuPaul, 2013 for a review). It is unclear if the same deficits would exist for students meeting full diagnostic criteria for ADHD on a comprehensive, multi-method assessment involving informant reports, direct assessment, and archival records of performance.

To this end, Heiligenstein, Guenther, Levy, Savino, and Fulwiler (1999) identified a sample of 26 students who self-referred to a university counseling and consultation service center and were given a diagnosis of ADHD based upon interview, rating scales, and neuropsychological testing. Findings of this study mirrored those described previously. Specifically, students with ADHD had a lower overall GPA, were more likely to be on academic probation, and reported experiencing more academic problems relative to non-ADHD students.

Although compelling, these data are limited in important ways. Such concordance of data seems to indicate that students self-reporting ADHD have similar deficits to those meeting full diagnostic criteria. This conclusion is tentative because Heiligenstein and colleagues' sample was relatively small and based upon retrospective chart review. Further, all data were from a single university thereby limiting the generalizability of their findings to the broader population.

More globally, as the number of students with any disability attending college rises, colleges are offering more types of student support services in recognition of the relationship between first semester and first year GPA and retention (Allen, 1999; Mitchel, Goldman, & Smith, 1999; Murtaugh, Burns, & Schuster, 1999) and given the disproportionate level of attrition prior to the second year of college (Levitz, Noel, & Richter, 1999; Newman et al., 2011; Tinto, 1996). Although such supports are not specific to students with ADHD, Wolf (2001) reported that 25% of students receiving disability support services are identified with ADHD. Interestingly, in an unpublished dissertation, Jackson (2013) reported that age of ADHD diagnosis (i.e., birth to 18 versus after age 18) did not relate to type of accommodations used but was related to continuous enrollment, such that students diagnosed prior to age 18 were more likely to be continuously enrolled in their institution. Unfortunately, Jackson did not report on the quantity or quality of services and available data suggests the availability and quality of such services is questionable, with only 40% of students reporting their university offered appropriate accommodations. Among students with access to sufficient accommodations, only 45% of students reported actually using them (Chew, Jensen, & Rosen, 2009). Common reasons for non-use of services include the perception of not needing help, inconsistent hours of operation, uncertainty of service location, lack of awareness of service delivery, or embarrassment associated with seeking support services (Mac an Bhaird, Fitzmaurice, NiFhlonn & O'Sullivan,

2013).

Empirical evaluations of common accommodations or academic service delivery are less common. Limited evidence indicates that extended time is not an effective accommodation for students with ADHD (Lee, Osborne, & Carpenter, 2010; Lovett, & Leja, 2013; Wadley & Liljequist, 2013). Similarly, support for strategic seating (i.e., sitting close to the point of instruction) is limited (Clifton, 2007). Evidence for more widely available services (e.g., math support centers) is again limited, but positive, suggesting that students who use such services benefit in terms of higher GPAs and higher rates of retention (Grillo, & Leist, 2013; Matthews, Croft, Lawson, & Waller, 2013). However, studies examining the impact of support services were not specific to students with disabilities, thereby limiting applicability to students with ADHD.

More intensive supports in the form of an 8-week coaching intervention for students with ADHD were associated with modest but statistically significant improvements in study and learning strategies, self-esteem, symptom distress, and satisfaction with school and work (Prevatt, Lampropoulos, Vowles, & Garrett, 2011). A small literature examining the impact of cognitive-behavioral therapy (CBT) for college students with ADHD is emerging with positive results in pilot studies (Anastopoulos & King, 2015; LaCount, Hartung, Shelton, Clapp, & Clapp, 2015). In both studies participants received a combination of group and individual supports, which resulted in significant reductions in ADHD symptoms and positive trends on academic outcomes. Similarly, Scheithauer and Kelley (2014) reported statistically significant reductions in self-reported ADHD symptomology and higher levels of goal achievement among college students with ADHD who had received study skill and self-monitoring instruction relative to a group who received study skill instruction alone. Within-subject analysis suggests

that the self-monitoring group had fewer self-rated ADHD symptoms, improved self-reported academic behaviors, higher levels of goal attainment, and higher GPAs relative to baseline.

In summary, ADHD is a chronic neurodevelopmental disorder characterized by significant impairments in attention and behavioral inhibition (APA, 2013). Individuals with this disorder generally experience significant difficulties with their academic achievement, leading to lower levels of college attendance, lower degree attainment, higher levels of academic problems, and fewer study skills (Weyandt & DuPaul, 2013). Although colleges generally offer academic support services, students do not necessarily utilize the services they are entitled to or have available to them (Chew et al., 2009). Despite this growing literature base, there exist several significant gaps in our understanding of ADHD amongst college students. First, although previous research has found differences in GPA between students with ADHD and those without the disorder, these findings are limited by small sample size, non-rigorous evaluation of ADHD, or limited generalizability due to samples being drawn from a single college campus. Second, research has not identified predictors of academic performance among college students with ADHD. Such information is important to appropriately target and tailor interventions to help students maximize their success in college. Third, although all colleges offer disability services and academic supports (e.g., math support centers) to students, it is less clear how often students with ADHD utilize these supports. Finally, it is unclear if service use is related to improved academic outcomes among students with and without ADHD during their first year at a four-year college. Such information is necessary given the relationship between first semester and first year GPA and retention (Allen, 1999; Mitchel, Goldman, & Smith, 1999; Murtaugh, Burns, & Schuster, 1999) and given the disproportionate level of attrition prior to the second year of college (Levitz, Noel, & Richter, 1999; Tinto, 1996)

Therefore, the current study addressed five questions:

1. Are there significant differences between the GPAs of students with and without ADHD at both the high school and college levels?
 - a. Based upon the findings of Kuriyan et al. (2013), it was predicted that students with ADHD would obtain significantly lower GPAs at both academic levels relative to non-ADHD peers.
2. What variables (e.g., high school GPA, SAT scores, demographic variables) significantly predict college GPA for students with and without ADHD, and is the magnitude of prediction equal across groups?
 - a. Based on previous findings, it was predicted that high school GPA and SAT scores would significantly predict college GPA. Further, it was hypothesized that these variables would be stronger predictors of college GPA among students with no disability relative to those with ADHD (Ackerman, Kanfer, & Beier, 2013; Belfield & Crosta, 2012; Kuriyan et al., 2013). Additionally, students with ADHD and comorbid mood disorders would have lower GPAs relative to students with a non-ADHD diagnosis and those students with no diagnoses. Students with ADHD and comorbid anxiety disorders would have lower functioning relative to comparison students, but higher functioning relative to students with ADHD alone given research indicating higher levels of anxiety may counter symptoms of inattention and impulsivity. (Barnard-Brak, Sulak, & Fearon, 2011; Crawford, Kaplan, &

Dewey, 2006; Hysenbegasi, Hass, & Rowland, 2005; Svanum & Zody, 2001).

3. Does the rate of disability and academic support service use among students with ADHD significantly differ from students with other disabilities and from those without any disability?
 - a. Based upon the findings of Chew et al. (2009), it was anticipated that approximately 45% of students with any disability would report using support services, with no significant differences between students with ADHD and those with any other disability classification, and both groups demonstrating higher service use relative to those with no disability classification.
4. What variables including demographic characteristics (e.g., gender, race, ethnicity), symptom severity, GPA or past service use predict service use in college?
 - a. This question is exploratory. Given the lack of prior research in this area, no specific hypothesis is stated.
5. Does self-reported use of academic and/or disability services predict improved academic outcomes?
 - a. Based upon past research (e.g., Matthews, Croft, Lawson, & Waller, 2013), use of academic support services was hypothesized to be significantly associated with improved academic outcomes.

Chapter II

Review of the Literature

Research indicates individuals diagnosed with ADHD experience significant difficulties related to their academic achievement, resulting in lower levels of college attendance (Kuriyan et al., 2013). Further, research has found that 5% of incoming first year college students self-reported a diagnosis of ADHD (Eagan et al., 2014). Previous studies have found that college students with ADHD have lower GPAs, more academic difficulties, and are more likely to be on academic probation relative to students without ADHD (Advokat et al., 2011; Blase et al., 2009; Lewandowski et al., 2008; Norwalk et al., 2009; Weyandt & DuPaul, 2013). Unfortunately, it is unclear how these results may generalize given that many of the studies conducted, to date, have studied relatively small samples, relied on mono-method assessment for the classification of ADHD, or have been restricted to a single college campus. Further, little research has been conducted regarding the predictors of college academic performance among students with ADHD.

In response to the growing number of students with ADHD and other disabilities attending college, and in an effort to improve outcomes for these students, post-secondary institutions offer an array of academic and disability support services (Newman et al., 2011). Unfortunately, there is limited information regarding the degree to which students with ADHD use such services. Additionally, there is very little evidence regarding the perceived and actual efficacy of services among this population. Finally, to date, there have been no investigations regarding predictors of academic service use among college students with ADHD. The purpose of this chapter is to: (a) review the extant research regarding the academic performance of college students with ADHD and (b) review the extant literature regarding the use of academic

support services by college students with ADHD.

Academic performance of college students with ADHD (RQ 1 and RQ 2)

Performance relative to other college students (RQ1). Research has found the individuals with ADHD are less likely to attend college relative to students without ADHD (Kuriyan et al., 2013). Further, among individuals with ADHD who do attend college, the preponderance of evidence suggests that they demonstrate significantly lower academic achievement relative to their college peers without ADHD. Specifically, research has found that these students have lower GPAs, experience more academic problems, are more likely to be on academic probation, and are more likely to withdraw from classes (Advokat et al., 2011; Blase et al., 2009; Lewandowski et al., 2008; Weyandt & DuPaul, 2013).

Kuriyan and colleagues (2013) utilized data on 326 male students with ADHD and 213 comparison students from the Pittsburgh ADHD Longitudinal Study (PALS) to investigate the educational and occupational outcomes across both groups. Results indicated that students with ADHD were significantly less likely to enroll in four year institutions (29.5% relative to 76.8% of controls). Similarly, students with ADHD (26.9%) were significantly more likely to pursue no post-secondary education relative to students without ADHD (4.9%). The authors reported that higher parent education, fewer lifetime academic problems, higher Wide Range Achievement Test (WRAT) scores, and fewer behavioral problems all significantly predicted college attendance across both groups. Unfortunately, Kuriyan et al. did not report data regarding the students' performance in college.

Among students in college, the preponderance of evidence suggests that students with ADHD report less effective study strategies, lower GPAs and more academic problems. For example, students with ADHD report using surface-level (e.g., rote memorization) study tactics

relative to more integrative and complex study strategies that have been associated with improved academic outcomes (Simon-Dack, Rodriguez & Marcum, 2014). Blase and colleagues (2009) found that self-reported ADHD among their sample of 3,400 undergraduate students was associated with lower GPAs and more academic concerns. Further, the authors found that among 846 first year students in their first semester, self-reported ADHD was related to lower GPAs and more academic problems in the spring semester of their second year. Additional evidence suggests that inattentive, but not hyperactive, symptoms are related to these academic difficulties (Rabiner, Anastopoulos, Costello, Hoyle & Sqartzwelder, 2008).

Importantly, these patterns of findings have also been generally replicated in studies using additional criteria for the establishment of an ADHD diagnosis (e.g., documentation of a current ADHD diagnosis, current medication for ADHD). Only one study conducted to date has found non-significant differences in GPAs between students with and without ADHD (Sparks, Javorsky, & Philips, 2004). This study is limited, however, because the authors were looking specifically at student functioning in foreign language courses, not overall college performance. Additionally, although all students had a university-accepted classification of ADHD, no independent data regarding symptom count or symptom severity were offered, which limits confidence in the classification of students (i.e., it is not possible to determine if the students all met DSM criteria for ADHD).

Conversely, studies that include both current symptom ratings and an external criterion typically find academic impairments among college students with ADHD. For example, Advokat and colleagues (2011) reported that those self-reporting a diagnosis of ADHD and a current prescription for ADHD medication ($N = 92$) had lower high school GPAs and lower ACT (but not SAT) scores relative to students without ADHD. Further, students with ADHD in this

sample reported lower GPAs and withdrew from more classes relative to the comparison group. Additionally, individuals with ADHD indicated that they were worse at planning for and completing assignments relative to their non-ADHD peers. Those with ADHD also reported less frequent note taking, less proactive studying (i.e., “Study well before the exam”) and more difficulties avoiding distractions when studying relative to their peers without ADHD.

Similarly Lewandowski et al., (2008) reported that the 38 students classified by a university Office of Disability Services as having ADHD were more likely to report problems with their academic functioning, including impairment with timed tests, a lack of test completion, a perception of having to work harder to achieve good grades, and spending longer periods of time to complete assignments relative to 496 students without this classification. Interestingly, in a follow-up study using a different sample, Lewandowski and colleagues (2013) reported that college students with ADHD ($n = 35$) either receiving accommodations for ADHD from the Office of Disability Services (66% of sample) or endorsing four or more symptoms on the ADHD Self-Report Scale (ASRS) symptom checklist (33% of sample) demonstrated no differences in test taking skills or performance relative to the 185 students without ADHD. However, students with ADHD believed they had performed more poorly and reported higher levels of test anxiety relative to the comparison group.

A similar pattern of findings is found among studies utilizing more extensive classification criteria. Specifically, Heiligenstein and colleagues (1999) conducted a retrospective chart review of students at the University of Wisconsin-Madison. Students included in the ADHD group had received a DSM-IV diagnosis of ADHD, a Brown Adult ADHD Rating Scale score greater than 50, reported symptoms during childhood, and had Test of Variables (TOVA) scores typical of individuals with ADHD. Results of this study again indicated that

students with ADHD had significantly lower GPAs, more academic problems, greater overall psychosocial problems (e.g., anxiety) and were more likely to be on academic probation relative to students without ADHD. Additionally, Weyandt and colleagues (2013) utilized self-report of current ADHD symptomology using the Conners' Adult ADHD Rating Scales (>90th percentile) and met DSM-IV-TR (APA, 2000) criteria for ADHD based on a diagnostic interview with the student or the student's parent. Results indicated that students with ADHD reported higher levels of psychopathology, had significantly lower grades on course assignments, less well-developed organizational skills, greater deficits in executive functioning, and greater difficulties with social adjustment related to their role as students.

To date, only one study has utilized a multi-method, multi-informant classification system (Shaw-Zirt, Popali-Lehane, Chaplin & Bergman, 2005). Specifically, Shaw-Zirt et al.'s system of classification consisted of self-report ratings of ADHD using the Wender Utah Rating Scale and the Attention Deficit Disorder-Hyperactivity Adolescent Self Report Scale, informant report using the Parent's Rating Scale, and structured interviews using The Structured Interview for ADD-H Symptoms with both the student and the identified informant. With this more rigorous classification criteria, Shaw-Zirt and colleagues found lower ratings of academic adjustment, social adjustment, and self-esteem among students with ADHD relative to those without ADHD.

Collectively, regardless of the rigor in classification procedures, it appears that endorsement of an ADHD diagnosis or ADHD symptomology is associated with increased academic difficulties. Additionally, results indicate that students endorsing ADHD or having a verified ADHD diagnosis demonstrate lower subjective ratings of academic adjustment, greater levels of psychopathology, and less developed organizational and study skills. Further, deficits

noted during a student's first semester are predictive of continued impairment during his/her fourth semester.

Predictors of academic performance (RQ2). Although the literature is clear regarding the academic difficulties experienced by students with ADHD, less is known regarding the variables that predict academic performance within this group of students. The current literature review identified ADHD symptom severity, academic service use, standardized test scores (e.g., ACT / SAT scores), high school GPA and demographic variables as predictors of academic performance.

ADHD symptomology. With regard to ADHD symptomology, most studies looking at academic outcomes in this area relied on the full range of ADHD symptoms and not specifically a diagnosis of ADHD, which limits the applicability of these findings to students meeting full diagnostic criteria for the disorder. For example, Norwalk, Norvilitis, and MacLean (2009) asked 321 college students to complete questionnaires regarding ADHD symptoms, academic and social adjustment, self-efficacy, study skills, and GPA. Higher levels of overall ADHD symptoms were related to lower self-efficacy, lower academic adjustment, lower study skills, and lower GPA. When looking at individual symptom clusters, only the inattentive symptoms significantly predicted self-efficacy, study skills and academic adjustment. Similarly, Glutting and colleagues (2002) obtained self- and parent-ratings of ADHD symptoms for 680 college students. Results indicated that parent-rated inattentiveness was significantly and negatively related to first year GPA. Interestingly, student ratings of symptomology were not related to any academic outcomes. Conversely, Frazier, Youngstrom, Glutting, and Watkins (2007) found that higher self- and parent-ratings of inattentiveness among 380 first year students were significantly related to GPA such that as inattention increased GPA decreased. These results are consistent

with some research among younger children that found that ratings of inattention, but not hyperactivity, predict negative academic outcomes (Merrell & Tymms, 2001). However, in general, past studies directly comparing subtypes of ADHD have found non-significant differences between subtypes (combined versus inattentive) on academic outcomes (Cota, 2008; Faraone, Biederman, Weber, & Russell, 1998; Morgan, Hynd, Riccio, & Hall, 1996; Murphy, Barkely, & Bush, 2002). These findings may be best explained by a sharper decline in hyperactive symptoms with age (Biederman, Mick, & Faraone, 2000). Specifically, given the relatively low prevalence of the hyperactive-impulsive symptoms in adulthood, it is the persistent inattentive symptoms that best delineate functional impairment in academic domains.

Comorbid diagnoses. Research indicates that the majority of students with ADHD will also meet diagnostic criteria for at least one other psychiatric disorder (Barkley, 2015). Despite the high prevalence of comorbid conditions with ADHD, very few studies have detailed the impact of additional diagnoses on the functioning of individuals with ADHD. One of the few studies directly addressing this topic among children with ADHD found that there is a negative relationship between the presence of coexisting disorders and academic achievement (Barnard-Brak, Sulak, & Fearon, 2011). Specifically, Barnard-Brak et al. found that students with any comorbid diagnoses showed slow growth in academic achievement relative to students with ADHD alone. These results mirror those reported by Crawford, Kaplan and Dewey (2006). In a study of 102 children with ADHD (M age = 12.3 years), Crawford and colleagues found that children with ADHD plus at least two additional diagnoses had significantly more impairment with regard to academic skills relative to children with ADHD alone. The findings from both studies are limited due to a lack of specificity in the coexisting conditions. It remains unclear if all potential comorbidities (e.g., blindness, learning disability, anxiety) negatively impact

academic achievement, or do so equally.

More carefully delineating the differential impact of comorbid disorders may be important given limited evidence that some disorders have a positive impact on academic achievement. Among a sample of 412 university students, Svanum and Zody (2001) reported that students with an anxiety disorder had higher GPAs relative to students with no disorder. Conversely, mood disorders (i.e., depression and dysthymia) were associated with lower GPAs relative to the control group. The negative impact of depression on academic achievement was replicated by Hysenbegasi, Hass, and Rowland (2005) who reported a diagnosis of depression was associated with a 0.49 point decrease in student GPA. Although these results are not specific to students with ADHD, it is possible that different comorbid diagnoses may exacerbate or mitigate the impairments associated with ADHD.

Service use. There is a small but growing literature base regarding service use among college students with ADHD. Unfortunately, the majority of studies have found that most services (e.g., extended time and preferential seating) have not been associated with improvements in academic performance for students with this disorder (Advokat et al., 2011; Clifton, 2007; Lee, Osborne, & Carpenter, 2010; Rabiner et al., 2008). There are some data suggesting that coaching may improve outcomes for students with ADHD (Allsopp, Minskoff, & Bolt, 2005). Similarly, comprehensive CBT programs have demonstrated significant reductions in symptomology, use of organizational skills, and self-report of impairment (Anastopoulos & King, 2015; LaCount, Hartung, Shelton, Clapp, & Clapp, 2015). More broadly, there is a small literature base suggesting that students who use mathematics support centers (MSCs) are more likely to complete mathematics courses and have higher grades in these courses relative to students who do not use MSCs (Matthews, Croft, Lawson, & Waller, 2013). Additionally, there

are some data suggesting participation in a general 'college survival skill course' can have an impact on GPA. Given the purpose of this section (i.e., identifying the predictors of academic functioning), ADHD coaching, MSCs and the college survival skill course will be reviewed here. Studies investigating accommodations for students with ADHD that have been largely ineffective for this population will be reviewed in the service use section of this chapter.

Allsopp and colleagues (2005) developed and tested an individualized course-specific strategy with 48 students diagnosed with learning disabilities (LD) and/or ADHD. Of this sample, 39% were diagnosed with ADHD alone or with ADHD and LD. Results indicated that the intervention led to significant gains in overall GPA following one semester of implementation. Additionally, students on academic probation demonstrated more substantial gains relative to students not on academic probation. Despite these positive results, only 48% were judged by Allsopp et al. to be improved after the first semester of intervention. To further explain the findings, the authors reported two factors that were associated with improvement: (a) independent use and application of taught strategies and (b) a supportive relationship between the coach and student. Additionally, factors associated with non-improvement included: (a) non-use of taught strategies, (b) difficulty mastering strategies taught, (c) significant academic deficits (e.g., reading fluency) that limited skill use, (d) severe emotional difficulties (e.g., anxiety or depression), or (e) difficulty managing medication.

Anastopoulos and King (2015) reported preliminary results of their Accessing Campus Connections and Empowering Student Success (ACCESS) program for 42 undergraduate students. ACCESS is an 8-week active treatment group followed by a semester-long maintenance phase. The active component consists of eight 90-minute group CBT sessions and eight 30-minute individual mentoring meetings. The maintenance phase consists of 30-minute

individual sessions every two to three weeks during the second semester. Topics covered include knowledge of ADHD, behavioral strategies to promote academic success (e.g., study skills, test taking strategies) and cognitive therapy (e.g., recognition of maladaptive thoughts, establishing replacement thoughts). Results of the program suggested significant changes in ADHD knowledge, academic strategies, cognitions related to ADHD, executive functioning and symptoms of ADHD. With regard to educational functioning, only a subsample of 23 students was available for analysis and although GPAs increased by .2 points following participation in ACCESS, this gain was not statistically significant. Regardless, the ACCESS program demonstrates significant promise for promoting academic functioning specifically among students with ADHD.

In a recent meta-analysis, Matthews and colleagues (2013) reviewed the extant literature regarding MSCs. The authors concluded that MSCs have been shown effective in promoting student retention, facilitating course completion, and increasing the academic performance of students in math courses. Unfortunately, results of the studies included in the review are difficult to interpret because they rely on general indicators of service use with minimal controls for external factors. For example, Mac an Bhaird, Morgan, and O'Shea (2009) found that students who visited their MSC more than once had higher pass rates and higher grades in mathematics courses relative to those attending once or less. In general, the effects were larger for students with greater risk (i.e., lower baseline mathematics development); however, the majority of at-risk students (66-74%) never attended the MSC. Mac an Bhaird et al. further noted that it is difficult to draw firm conclusions regarding the impact of MSCs on student outcomes and that visiting a MSC is insufficient to improve a student's GPA. Instead, the student must be willing to work independently, using the MSC as a resource to further their education.

Pell and Croft (2008) conducted an analysis of 644 engineering students (90% male) enrolled at Loughborough University. The majority of these students (79%) visited the MSC 0-1 times, followed by 2-9 visits (18%) and 10+ times (3%). Pell and Croft concluded that attendance at MSC increased the pass rate of students by approximately 3%. Further, based upon the estimated impact of the MSC on grades they estimate that approximately half of the students who failed their course could have passed by attending the MSC regularly. Similarly, MacGillivray (2009) reported that attending the Queensland University of Technology Mathematics Access Centre at least once was associated with higher mean scores across a range of mathematics courses. Alternatively, although means were higher among those attending the MSC, confidence intervals for the available scores indicated significant overlap between groups making interpretation difficult. Collectively, results from the MSC literature indicate that such services are effective; however, significant limitations in the evaluation of these supports make drawing conclusions difficult.

Finally, one study has investigated the impact of a 'college survival skills course' on the academic outcomes of college students (Allen & Lester, 2012). The course was taught by an academic success coach and the curriculum included study skills, note-taking, prioritizing work, and time management. Although students were not required to take the course, those in learning support math courses were strongly encouraged to take the class during the same semester as their math course. Results indicated that students enrolled in the college survival skills course had higher rates of retention among three sections of learning support math courses (76.8%) relative to students not enrolled in the college survival skills course (63.6%). Additionally, among students enrolled in one section of learning support math ($n = 178$), those students who participated in the college survival skills course obtained a higher mean GPA (2.54) relative to

those who did not utilize this course (2.49). Unfortunately, Allen and Lester did not conduct any direct statistical comparisons and therefore it is unclear if these modest gains are statistically significant.

Collectively, the conclusions that can be drawn from these studies are limited by the lack of control demonstrated in many of the reviewed studies. It remains unclear if the academic performance of students using these services is significantly improved relative to students not using these services. Further, it is unclear if the observed improvements (statistically significant or not) are due to the actual service use or may be better explained by some third factor such as total study time (i.e., students who utilize more support services may spend more total time studying relative to those students who do not resulting in improved academic performance). Finally, the majority of studies were conducted with a general undergraduate sample, and therefore the results may not generalize to those students with ADHD. Despite these limitations, it appears that use of the services described here are at least associated with student success in some way.

High School Achievement and Standardized Tests. A number of studies have found that high school academic achievement, high school GPA, and standardized tests (SAT) significantly predict both college enrollment and subsequent academic achievement in college. For example, Kuriyan and colleagues (2013) found that among students with ADHD, academic achievement (as measured by the WRAT) in high school predicted enrollment in a 4-year institution relative to no school, vocational or technical school, and to a community or junior college. Among college students, Kuh, Cruce, Shoup, and Kinzie (2008) conducted a regression analysis to predict first year GPA and found that pre-college achievement scores were positively associated with first year GPA. Additionally, a high school GPA in the B or C range was negatively

associated with the student's first year college GPA. Furthermore, high school GPA and achievement remained a significant predictor of first year GPA even when additional factors were added into the regression analysis (e.g., 21+ hours worked off-campus, 21+ hours per week socializing). Further, results indicated a positive linear relationship between ACT scores and college GPA.

Hoffman and Lowitzki (2005) reported on data collected from 522 college students attending a private Lutheran university. Similar to the studies described thus far, both GPA and student SAT scores were significantly and positively related to college academic achievement. Ackerman, Kanfer, and Beier (2013) followed 589 undergraduate students throughout their college career to identify predictors of baccalaureate success. Results indicated that high school GPA and SAT scores predicted 23% of the variance during the students' first year, 20% of variance during year two, 21% of the variance during their third year, 15% of variance in their fourth year, and 26% of the variance in their cumulative GPA. Similarly, Belfield and Crosta (2012) found that high school GPA was positively correlated with college GPA and college credits earned. Collectively, although these findings have not been demonstrated among students with ADHD specifically, the available literature suggests that high school GPA is a significant predictor of college GPA both during the student's first year and throughout his/her college career.

Demographic Variables. There is some evidence to suggest that demographic variables such as gender, ethnicity and SES are significant predictors of college academic achievement. The results from Hoffman and Lowitzki (2005) indicated that high school grades were significantly and positively related to college GPA for all students. The authors also reported that high school GPA was significantly related to academic involvement in college for non-Latino

students, but not for Latino students. Additionally, high school GPA was associated with retention among Latino students, but not among non-Latino white students. The relationship between SAT scores and academic achievement was weaker for Latino students relative to the sample as a whole. With regard to gender, results indicated a main effect of gender such that female students earned higher GPAs relative to male students. This relationship was significant among white students but not Latino students. Conversely, when considering retention, Latina students were more likely to be continuously enrolled relative to Latino students; however, this relationship was neither observed among white students nor among the total sample.

Kuh and colleagues (2008) reported similar results, such that female students had higher first year GPAs and were more likely to persist to the second year of college. Conversely, African American students had lower first-year GPAs and Latino students demonstrated significantly lower persistence into the second year of college. With regard to parent variables, the number of parents with a 4-year degree was positively associated with first-year GPA although income of \$30,000 or less was negatively associated with college academic achievement.

In their study investigating the impact of daytime sleepiness on academic performance among 68 college students with ADHD Langberg, Dvorsky, Becker, and Molitor (2014) also reported that females had higher GPAs relative to males. Further, daytime sleepiness was associated with higher school maladjustment and negative academic outcomes. Interestingly, students living at home demonstrated lower levels of overall impairment relative to those living in dorms.

Collectively, the results of these studies suggest that basic demographic variables may have an impact on the academic performance of college students. Although it is unclear the

degree to which the results specifically apply to students with ADHD, they provide an indication of variables of interest when considering predictors of college academic achievement.

College Service Use (RQ 3, RQ 4 and RQ 5)

Rate of service use (RQ3). There are relatively limited data regarding the rate at which students utilize support services. Chew, Jensen, and Rosen (2009) conducted an investigation of 196 college students' attitudes toward students with ADHD. A total of 30 students in their sample reported having ADHD. Of these students, 40% reported that the university offered sufficient accommodations. Among students receiving appropriate accommodations, 45% (about 5 of the initial 30 students or 16.6% of the total sample) reported actually using the available accommodations. These results are lower relative to those reported by Sparks and colleagues (2004). Specifically, Sparks et al. reported that only 32% of their sample of 68 students with ADHD ever requested and used available accommodations (e.g., extended time) in their completion of foreign language requirements.

In a study aimed at identifying the reasons for student non-engagement with MSCs, Mac an Bhaird, Fitzmaurice, NiFhlonn and O'Sullivan (2013) reported that among 1633 college students, 36.1% had utilized the MSC at least once. Interestingly, the rate of usage reported here mirrors the findings among students with ADHD. Allen and Lester (2012) reported that 52% of all students in their college enrolled in a college survival skills course. Although this finding is higher relative to the other data reviewed here, this finding indicates that at best, approximately half of students who could benefit from additional services will not receive them.

Collectively, these results suggest that students with access to additional services or accommodations do not typically use them. Although the rate of use was higher among more general populations, most data suggest relatively low usage of services. Based on this

information, it appears that service use should range between one-third and one-half of eligible students.

Predictors of service use (RQ4). Although the rate of usage is not high, it is important to consider the factors that may predict the use of academic support services. Unfortunately, the majority of the extant literature has focused on identifying the aspects of students' non-use of academic services. For example, Mac an Bhaird and colleagues (2013) reported that among the 64% of students not using the MSC, approximately 50% indicated that they did not need help, 29% reported that the available times did not work with their schedule, 18% reported not knowing where the MSC was located, 15% stated they hated math, 12% indicated they were embarrassed to go, and 9% indicated they had never heard of the MSC. These findings were similar to those reported by Symonds, Lawson, and Robinson (2008) who conducted 77 interviews and found that most non-users were unaware of the MSC's location (35%), were unaware that such services were available (27%), were fearful of embarrassment (26%), or did not believe they had a need for math support (23%). Grehan, Mac an Bhaird, and O'Shea (2010) conducted in-depth interviews with seven students at the National University of Ireland at Maynooth. Analysis revealed four types of fear as the primary barriers to service use: fear of failure, fear of showing a lack of knowledge or ability, fear of being singled out, and fear of the unknown.

Only one study (Laskey & Hetzel, 2011) identified a potential predictor of service use. Laskey and Hetzel utilized a sample of 115 college students admitted to the university via the conditional acceptance program. The majority of the sample was female (63%) and African American (43%). Results indicated an inverse relationship between ACT scores and the utilization of tutoring services. Additionally, Laskey and Hetzel reported a positive relationship

between high school GPA and tutoring services. Further, students continuing enrollment in the university utilized the tutoring services more often relative to those who were not retained. It is important to note that the students in this program were required to meet with a tutor once per week and therefore these results may not generalize to the broader college population.

Outcomes of service use (RQ5). As the number of students with any disability attending college rises, colleges are offering more types of student support services (Newman et al., 2011). With the increase in student services, researchers have begun to look at the outcomes of their service provision, including a growing literature base regarding the effectiveness of services for students with ADHD.

For example, Wadley and Liljequist (2013) reported that among 129 college students, extended time had no significant effect on test scores or on amount of time students took to complete the tests. Further, students with ADHD took more time to complete tests regardless of testing condition relative to students without ADHD and students with ADHD obtained lower test scores and lower self-esteem relative to students without ADHD. Similarly, Miller, Lewandowski, and Antshel (2013) found that there were no differences in items attempted or answered correctly at standard time, time and one-half or double time among 76 college students with and without ADHD. Miller et al. reported that the ADHD group attempted and answered significantly more test items at extended time relative to the non-ADHD group at standard time, suggesting that extra time creates an advantage for college students with ADHD. Lee, Osborne, and Carpenter (2010) found a similar pattern such that extended time was not associated with improved academic performance among college students with ADHD. Interestingly, students with ADHD performed better on computerized tests relative to paper-and-pencil tests. Not surprisingly, Lovvett and Leja (2013) found that more ADHD symptoms were associated with a

modest negative correlation with extended time suggesting less benefit from extended time relative to students with fewer ADHD symptoms. Collectively, these results suggest that extended time is not an appropriate accommodation for students with ADHD.

Similar to the accommodation of extended time, preferential seating has also been shown to be ineffective for students with ADHD. Specifically, Clifton (2007) conducted two studies to determine the impact of seat placement among students with ADHD. In the first study, Clifton conducted naturalistic observations of 350 students. Results suggested that students sitting closer to the instructor had higher GPAs and fewer absences. In the second study, Clifton created three analog lectures and systematically varied the seats of 76 students. The results of this study suggested no significant differences in grade based upon the student's seat. Clifton suggested that the relationship between seat placement and grade may be better explained by other factors such as student motivation to do well in a given course. Therefore, seat placement may be a byproduct of a given student's desire to perform well rather than a predictor of performance during college.

ADHD coaching is another commonly suggested intervention. Prevatt and Yelland (2013) developed and tested an 8-week coaching program among 148 college students with ADHD. Results indicated that participants who received coaching demonstrated significant gains in study skills as measured by the Learning and Study Skills Strategies Inventory. Similarly, as described previously, Allsopp and colleagues (2005) found that individualized course-specific instruction led to significant gains in overall GPA following one semester of implementation. The effect of intervention was greater for students on academic probation; however, only 48% were judged by Allsopp et al. to be improved after the first semester of intervention.

As previously discussed, Anastopoulos and King (2015) CBT-based ACCESS program had numerous positive outcomes regarding core ADHD symptomology and a strong indication

for academic improvements. LaCount and colleagues (2015) describe a similar CBT-based program consisting of four modules: (a) psychoeducation, organization and planning; (b) reducing distractibility; (c) adaptive thinking; and (d) additional skills. This treatment is designed to be delivered in 20 one-hour training sessions over a 10-week period with one group meeting and one individual meeting per week. Initial results using a sample of 17 students suggested significant reductions in inattentive symptoms using an intent-to-treat analysis with stronger effects for the 12 students who completed treatment. Additionally, significant reductions in student-rated impairment at school and work were noted following completion of the program. Collectively the results of the ADHD coaching and CBT-based interventions suggest that individualized supports may be more effective for students with ADHD relative to more general academic supports (e.g., extended time).

Scheithauer and Kelley (2014) tested the effectiveness of a self-monitoring intervention to improve outcomes of a brief study skills training. The authors recruited 53 students with a previous diagnosis of ADHD and a current prescription for ADHD medication to receive a brief (i.e., 30 minute) training on study skills (e.g., specific study strategies, organization, self-testing, distraction-free studying). The final sample consisted of 41 students, 22 of whom also received a 40-minute session to develop a self-monitoring system related to their academic goals and study strategies. The self-monitoring group had integrity checks conducted every 2 to 4 days, and all participants completed two 10- to 20-minute check-in sessions over the spring semester.

Although post-test ANOVAs did not reveal statistically significant differences between groups for GPA, Bonferonni-corrected, dependent-sample *t*-tests indicated the self-monitoring group had a statistically significant increase in GPA relative to the comparison group. The failure of the initial ANOVA to reach statistical significance is likely due to the Scheithauer and Kelley's

failure to control for significant baseline differences between both groups on GPA. The ability of the self-monitoring intervention to reduce the initial significant differences to non-significance further suggests that self-monitoring, in addition to brief study skills training, may be efficacious for students with ADHD.

More broadly, attendance at a MSC has been associated with improved engagement, performance, retention and confidence in math courses (Matthews et al., 2013). The impact of MSC may be heightened for student with weak mathematical backgrounds (Mac an Bhaird et al., 2009). Among mechanical engineering students, visiting a MSC at least one time was positively associated with academic performance during the student's first year (Lee, Harrison, Pell & Robinson, 2008). Additionally, data suggest that as students spend more time engaged in academic support services, likelihood of graduation goes up (Grillo & Leist, 2013); however, student GPA mediates the relationship between service use and graduation. In one study of 5939 college students, Rheinheimer and Mann (2000) found that there were significant benefits of college tutoring after 5 hours of service use. Alternatively, when considering GPA as a covariate students needed at least 15 hours of tutoring to achieve significant gains in GPA.

Contributions of the current study

The current study seeks to address four main gaps within the extant literature. First, the current study is the first to examine differences in GPA using a rigorously defined, multi-site sample. Second, the current study seeks to identify the predictors of academic performance specifically among college students with ADHD. Third, this study provides data regarding how often students with ADHD utilize academic support services. Finally, the current study investigated the academic outcomes of service use among students with and without ADHD during their first year at a four-year college.

CHAPTER III

Method

Participants

Participants for the present study are a subsample from the Trajectories Related to ADHD in College (TRAC) project, a larger multi-site National Institutes of Mental Health funded project aimed at determining the developmental trajectories of college students with ADHD relative to those without ADHD. The larger project consists of 456 first-year college students recruited in two cohorts from three geographic centers located in North Carolina, Pennsylvania, and Rhode Island (228 with ADHD; 228 comparison students recruited from nine colleges). The total sample consisted of 236 females (51.8%) and was mostly Non-Hispanic Caucasian (67.5%). To be included in the ADHD group, students or their parents had to endorse at least four symptoms of ADHD during childhood and during the last six months. Additionally, all students were required to meet full DSM-5 diagnostic criteria (APA, 2013) for ADHD on a semi-structured interview developed for the current project.

To be included in the comparison group, participants and their parents could endorse no more than three symptoms of ADHD on the retrospective childhood ratings scale and the current (6-month) rating scale. Similarly, participants could endorse no more than three symptoms of ADHD on the semi-structured interview described below. Students rated as having four symptoms on the semi-structured interview were excluded from the project to avoid the inclusion of students with subclinical ADHD and to ensure adequate differentiation between the two groups of interest. Final classification decisions were made via consensus among a group of four ADHD experts. There were no significant differences between groups based on age, gender, SES, racial or ethnic diversity (see Table 1).

For the current investigation, cases were included on an analysis-by-analysis basis using all cases with complete data for a given research question. Sample sizes ranged from 220 (Predictors of GPA and Outcomes of Service use) to 420 (Rate of Service Use). Sample sizes varied given the staged approach to data collection and presence of missing data. Specifically, some students did not return during year one for assessments including service use. Similarly, GPA data was not available for all students. Sample sizes for each analysis are listed in Table 2.

Classification Measures

Demographic data. Participants provided a range of demographic information including age, gender, race, ethnicity, parental education, and parental occupation. Additionally, they were asked to indicate if they identify as “Hispanic or Latino” or “Not Hispanic or Latino.” Further, participants were asked to indicate all races with which they identified (i.e., Caucasian, African-American, Asian, Native American, or Other). Participants endorsing more than one race were coded as “More than 1 race.” Participants were also asked to report both of their parents’ highest level of education (i.e., “some high school,” “completed high school,” “some college,” “Associates,” “Bachelors,” “Masters,” or “MD, PhD, JD etc.”) and indicate both of their parents’ occupations. For the current study, parent education was coded according to the highest educational level attained by either of the student's parents (i.e., the highest value reported by the student). Responses regarding parent occupation were coded according to Nam–Powers-Boyd Occupational Status Scale (Nam & Boyd, 2004). This method considers both the median educational level and median income for a given profession relative to the overall workforce in the United States based on the 2000 U. S. Census and provides a score that ranges from 0-99. Again, the score from the higher parent was used to provide an estimate of the student's socioeconomic status.

ADHD rating scale self-report. Two 18-item rating scales were created for the TRAC project to capture students' self-reports of ADHD symptomology in childhood (i.e., prior to age 12) and during the last 6-months. Both the Childhood and Current versions of the form asked participants to rate how often each symptom of ADHD described their typical behavior. Responses ranged from 0 (Never or rarely) to 3 (Very often). On the Childhood form, students were asked to complete one of two columns (Never on Medication or Took medication but rating based when off). The Current version was identical but asked students who were on medication to provide symptom ratings both when they are off their medication and when they are on their medication. The form yields three scale scores that map onto the three presentations of ADHD: Inattention, Hyperactive-Impulsive, and Combined. Additionally, the measure provides severity scores for each presentation of ADHD. Preliminary psychometric data from the larger TRAC sample indicate that these ratings scales have good to high internal consistency ($\alpha = .74 - .94$).

ADHD rating scale parent-report. One rating scale was created for the TRAC project to capture parent report of ADHD symptomology in childhood (i.e., prior to age 12) and during the last 6-months. One parent for each participant was instructed to provide ratings regarding their child's behavior off medication for both time points. The content and scores of the questionnaire were identical to the ADHD rating scale self-report. Similar to the self-report scale, preliminary psychometric data from the larger TRAC project sample indicate that scales on this measure have high internal consistency ($\alpha = .89-.94$).

Semi-structured interview for adult ADHD. The semi-structured interview for adult ADHD is a two-module interview that is directly mapped onto the DSM criteria for ADHD. The inattention module consists of nine items and asks the students to indicate if a given symptom describes them most of the time and to indicate the settings and contexts in which the symptom

has caused impairment. When students taking medication for ADHD indicated that a given item did not describe their typical behavior, the same question was repeated in reference to their behavior off medication. Students could meet criteria for ADHD based on the combination of symptoms endorsed on and off medication. In addition, students were asked to indicate their age when they first noticed the symptoms they endorsed, at what age the symptoms began causing difficulties for them, if the symptoms have been a concern for themselves or others, and if there has ever been an extended period of remission from symptoms. The interview produces three scale scores: Inattention, Hyperactivity-Impulsivity, and Combined. Psychometric data indicate that the Inattention ($\alpha = .90$), Hyperactivity-Impulsivity ($\alpha = .85$) and Combined ($\alpha = .93$) scales all have strong internal consistency.

Expert panel classification. The expert panel consisted of four Ph.D. level psychologists with expertise in the assessment and treatment of ADHD, including the three principal investigators of the larger TRAC study and one consultant who specializes in the assessment and treatment of adult ADHD. The panel utilized the data described previously to determine the eligibility for each student enrolled in the current project. Classification of ADHD or comparison for the current study was based upon the unanimous decision reached by the four-member expert panel. Additionally, the expert panel made final decisions regarding psychological classifications for each participant (e.g., anxiety or mood disorder). Specifically, each panel member independently reviewed each case and indicated a classification for that participant. In order for a participant to be classified in a specific group or as having a given psychological classification, all four panel members must have given that classification for the participant. In instances in which the panel members came to different classifications, the entire panel discussed the case until consensus was reached.

Independent and Dependent Variables

Structured Clinical Interview for DSM Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 1996). The SCID-I is a structured interview that systematically addresses mood, anxiety, and other Axis I disorders in accordance with DSM-IV-TR criteria. For the current study, Module A (Mood Episodes), Module D (Mood Disorders), and Module F (Anxiety and Other Disorders) were administered by graduate students in school or clinical psychology.

Beck Depression Inventory-II (Beck, Steer, & Brown, 1996). The BDI-II is a 21-item self-report measure for measuring the severity of depression in adults and adolescents 13-years and older. Participants are asked to read and select a response from 21 sets of statements describing their feelings during the past two weeks. For example, under the heading of ‘Sadness’ participants are given four options: “I do not feel sad,” “I feel sad much of the time,” “I am sad all the time,” or “I am so sad or unhappy that I can’t stand it.” The BDI-II provides two scale scores (i.e., Cognitive and Somatic-Affective) and a total score. Scores can range from 0 to 63 and the following screening cut scores have been developed by Beck et al.: 0-13 minimal; 14-19 mild; 20-28 moderate; 29-63 severe. The BDI-II has been found to have adequate internal consistency among college students ($\alpha = .93$). Additionally, data have indicated adequate test-retest correlations across multiple studies (Beck et al., 1996; Sprinkle et al., 2002). Specifically, Beck and colleagues utilized a 1-week interval resulting in a correlation of .93. Similarly, Sprinkle et al., reported a correlation of .96; however, their retest interval was 3.2 days on average, with a range of 1 to 12 days.

According to Beck and colleagues (1996), the BDI-II was found to be highly correlated with the previous version of the measure, the BDI-IA ($r = .93, p > .001$) and moderately correlated to the *Beck Hopelessness Scale* ($r = .68$), *Scale for Suicide Ideation* ($r = .37$), *Beck*

Anxiety Inventory ($r = .60$), *Revised Hamilton Psychiatric Rating Scale for Depression* ($r = .71$), and the *Revised Hamilton Anxiety Rating Scale* ($r = .47$). Sprinkle and colleagues (2002) reported a large correlation between the BDI-II and the SCID-I ($r = .83$).

Beck Anxiety Inventory (Beck & Steer, 1993). The BAI is a 21-item scale that measures anxiety in adults and adolescents 17 years and older. Participants were asked to read a series of symptoms and indicate how much they have been bothered by each symptom during the past week on a four-point scale: “not at all,” “mildly,” “moderately,” or “severely.” The BAI has been found to have adequate internal consistency ($\alpha = .92$). With regard to test-retest reliability, Beck and Seer reported a one week correlation of .75 and De Ayala, Vonderharr-Carlson, and Kim (2005) conducted a review of published studies and found an average test-retest reliability estimate of .66 based on an average interval of 32.1 days.

Beck and Steer (1993) also reported that the BAI is moderately correlated ($r = .15-.61$) with other measures of anxiety (e.g., *Hamilton Anxiety Rating Scale – Revised*, the anxiety subscale of the *Cognition Check List, Weekly Record of Anxiety and Depression*).

Educational data. Participants’ educational data (i.e., high school and college GPA and SAT scores) were collected in two ways. Educational data were provided via university record from each student’s application and high school transcript ($n = 341$). When archival data were not available due to university policy regarding the release of student information, participants were contacted by a research assistant to provide these data via self-report ($n = 13$). Additionally, all participants completed the word reading, numerical operations, and essay composition subscales of the Wechsler Individual Achievement Test - Third Edition (WIAT-III; Wechsler, 2009a). The WIAT-III has been shown to have excellent reliability and validity among young adults (Wechsler, 2009b). Finally, participant IQ scores were estimated using the two-subtest

score from the Wechsler Abbreviated Scale of Intelligence (WASI 2nd Edition; Wechsler, 2011). The WASI has very good to excellent reliability and validity (Wechsler, 2011). All assessments were administered by graduate students or post-doctoral researchers in school and clinical psychology.

Pre-College service use. Data regarding the student's pre-college service use were obtained via self-report on the Services for College Students Interview (SCSI) - Pre-College Version, a semi-structured interview designed for the TRAC Project. This interview directly asks students if they had received a given service or accommodation, the start and end time of their services and how frequently they used those services. Specific options included: IEP, 504 or informal accommodations. For the purposes of the current study pre-college service use was captured dichotomously.

College service use. Data regarding the student's college service use were obtained via self-report on the SCSI College Version. This unpublished interview was developed for the TRAC Project and directly asks students if they received a given service or accommodation. Specific options included: "meet with a professor or your advisor to discuss your academic performance/progress," "campus tutoring services," "academic skill assistance," "writing/speaking assistance," "career counseling," "formal disability service accommodations." Frequency of service use was included in the present study.

Procedures

All procedures for the larger study were initially approved by the IRB of all three project sites. Students were recruited through a combination of electronic postings on Facebook, campus-wide e-mails, physical postings on campus, and direct referrals from disability services. Following informed consent, participants met individually with a research assistant to provide

demographic and screening data to determine project eligibility (i.e., ADHD rating scales and Semi-structured interview for adult ADHD). All meetings were held during the student's first year of enrollment in college. Following this meeting, research assistants mailed a copy of the ADHD rating scale – Parent version to the student's parent for his/her ratings. If the student met general requirements without parent ratings, the data were sent to the expert panel to finalize group status. If the student failed to meet criteria based on self-report, the case was delayed from panel review until parent ratings were received.

During the second meeting, participants completed a range of measures regarding their psychological functioning including the BAI and the BDI-II. Additionally, participants were administered the SCID by graduate students in school or clinical psychology. Following this meeting, data summaries were provided to the expert panel for classification of psychological disorders. During the third stage, participants completed a range of measures regarding their educational (i.e., WIAT-III), cognitive (i.e., WASI-2), social and vocational functioning and completed measures regarding their pre-college and college service use. Finally, at the end of the student's first year, registrars' offices were contacted to retrieve the student's academic records including their high-school data and the results of their first-year of college. For participants at colleges with incomplete data (i.e., no high school data) or who did not allow researchers access to student data, individual students were contacted to obtain the needed information. Finally, students received up to \$100 for their participation during that academic year, a summary report from the data collected during that academic year, and individual meetings were conducted to discuss results as needed.

Data Analytic Plan

To answer the stated research questions, a series of multivariate analyses of variance

(MANOVAs) and regression analyses were conducted using SPSS v. 21 ® software (IBM Corp, 2012). First, descriptive statistics including the means and standard deviations of all measures were calculated and reported. Next, data were checked for normality based upon skewness and kurtosis, normal probability plots and bivariate normality plots. Next, Box's test was used to assess the homogeneity of the covariance matrices. Finally, all analyses in the current study were conducted with medication use as a covariate to control for the documented effectiveness of pharmacotherapy on ADHD symptomology in adults (Prince, Wilens, Spencer, & Biederman, 2014).

RQ 1: *Are there significant differences between the GPAs of students with and without ADHD at both the high school and college level?* To answer this question, a multivariate analysis of covariance (MANCOVA) was conducted to determine statistically significant differences between the ADHD and comparison groups on cumulative high school GPA, first-year fall GPA and first-year spring GPA.

RQ2: *What variables (e.g., high school GPA, SAT, demographic variables) significantly predict college GPA for students with and without ADHD and is the magnitude of prediction equal across groups?* Four hierarchical multiple regression analysis were used to answer this question (i.e., ADHD Fall GPA, ADHD Spring GPA, Comparison Fall GPA, Comparison Spring GPA). This analysis included demographic variables (i.e., race, ethnicity, SES, highest parent education), high school GPA, standardized test scores (SAT, WASI-2, WIAT-III), and non-ADHD psychological classifications entered hierarchically to determine predictors of first-year college GPA. Fisher's Z-test was used to determine if the magnitude of prediction is equal across groups. To complete this test the sample was split according to ADHD status, and separate regression analyses were run for each semester GPA. The resultant r values were entered into the

FZT program (Garbin, nd), which transforms the r values into Z-scores and provides an estimate of statistically significant difference between groups. For the current analysis, the two-tailed Z-critical value was 1.96 for $p < .05$ and 2.58 for $p < .01$.

RQ3: *Does the rate of disability and academic support service use among students with ADHD significantly differ from students with other disabilities and to those without any disability?* To answer this question, a seven-group (ADHD alone ($n=74$), ADHD + Anxiety ($n=11$), ADHD + Mood ($n=36$), ADHD + Other($n=17$), ADHD + Multiple ($n=54$), non-ADHD psychological disorder ($n=35$), no psychological disorder ($n=159$)) MANCOVA was run including six dependent variables: (a) frequency of meetings with professors or academic advisors, (b) frequency of tutoring sessions, (c) frequency of academic skills assistance, (d) frequency of writing or speaking assistance, (e) frequency of career counseling, and (f) frequency disability service accommodation use. As discussed previously, ADHD status was determined using the DSM-5 diagnostic criteria for ADHD. Other psychiatric conditions were based upon the DSM-IV:TR criteria as measured initially by the SCID and verified by the expert panel. The ADHD + Anxiety group consisted of students classified as having both ADHD and a DSM-IV:TR anxiety disorder (i.e., Generalized Anxiety Disorder, Social Phobia, Specific Phobia, Obsessive Compulsive Disorder, Post Traumatic Stress Disorder, or Anxiety Disorder Not otherwise Specified). Participants in the ADHD + Mood group consisted of students classified as having ADHD and a DSM-IV:TR Mood disorder (i.e., past or current major depressive episode, Dysthymic Disorder, Depressive Disorder Not Otherwise Specified, or Mood Disorder Not Otherwise Specified). Participants in the ADHD + Other category consisted of students classified as having ADHD and meeting criteria for a learning disability or eating disorder. Participants in the ADHD + Multiple category consisted of students meeting criteria for

ADHD and more than one additional class of disorder (i.e., any number of mood disorders with any number of anxiety disorders as defined previously). Students meeting criteria for one of the diagnostic categories described previously but not meeting criteria for ADHD were assigned to the diagnosed control group. Follow-up ANOVAs were conducted to determine specific differences following any statistically significant MANOVA results. Partial eta squared was calculated to provide an estimate of the effect size of significant differences.

RQ4: *What variables including demographic characteristics (e.g., gender, race, ethnicity), symptom severity, GPA or past service use predict service use in college?* To answer this question, a backward step-wise multiple regression was used given this procedure reduced likelihood of making a Type II error relative to the forward method (Field, 2009). This analysis included demographic variables (i.e., race, ethnicity, SES, highest parent education), pre-college service use, ADHD severity, and number of non-ADHD psychological diagnoses. This analysis included six dependent variables: (a) frequency of meetings with professors or academic advisors, (b) frequency of tutoring sessions, (c) frequency of academic skills assistance, (d) frequency of writing or speaking assistance, (e) frequency of career counseling, and (f) frequency disability service accommodation use.

RQ5: *Does self-reported use of academic and/or disability services predict improved academic outcomes?* To answer this question a hierarchical multiple regression analysis was employed. This analysis also included demographic variables (i.e., race, ethnicity, SES, highest parent education), high school GPA, standardized test scores (SAT, WASI-2, WIAT-III) entered hierarchically, and first year service use to predict cumulative first year GPA.

CHAPTER IV

Results

Research Question One

Demographic data for the total sample are reported in Table 1. A one-way MANCOVA was conducted to test the hypothesis that there were significant differences between the ADHD and comparison groups on cumulative high school GPA, first-year university fall GPA and first-year spring GPA. Prior to the analysis, data were checked for normality based upon skewness and kurtosis, normal probability plots, and bivariate normality plots. Skewness and kurtosis for each variable were within the suggested range of -2 to +2 (George & Mallery, 2010). Visual inspection of the normal probability and bivariate normality plots appeared within the normal range. Box's Test of Equality of Covariance Matrices was statistically significant and therefore Pillai's Trace was interpreted as it is robust with respect to this violation (Field, 2009).

Descriptive statistics for this analysis are included in Table 3. Results of the MANCOVA indicated that controlling for medication status, ADHD status had a statistically significant impact on GPA (Pillai's Trace = .099, $F(3,273) = 9.967$, $p < .001$, partial $\eta^2 = .099$). Follow-up analyses of covariance (ANCOVAs) indicated that comparison students had significantly higher GPAs relative to students in the ADHD Group. Specifically, the difference between the ADHD group ($M = 3.45$) and comparison group ($M = 3.82$) on high school GPA was statistically significant ($F(1) = 29.15$, $p < .001$, partial $\eta^2 = .096$). Similarly, the difference between the ADHD group ($M = 2.91$) and comparison group ($M = 3.25$) was statistically significant ($F(1) = 9.96$, $p = .002$, partial $\eta^2 = .035$) for fall GPA. Finally, the difference between the ADHD group ($M = 2.83$) and comparison group ($M = 3.13$) for spring GPA was statistically significant ($F(1) = 6.29$, $p = .013$, partial $\eta^2 = .022$).

Research Question Two

To identify variables that significantly predict college GPA for students with and without ADHD, four (ADHD status x Semester GPA) hierarchical multiple regression analyses were utilized. For each analysis, the assumptions of non-multicollinearity were met as evidenced by VIF values less than 10 and tolerance values greater than 0.2 (Menard, 1995; Myers, 1990). Additionally, homoscedasticity and normality of residuals were visually checked and determined to be within normal limits. Descriptive statistics are listed in Table 4.

Each hierarchical regression contained three blocks. Blocks were grouped conceptually based upon the availability of literature supporting the factors as related to academic outcomes. Therefore, the first level included ADHD medication status (for ADHD but not control participants), gender, ethnicity, race, highest parent education level, and highest parent job prestige score. The second level consisted of high school GPA, SAT total score, IQ score, and word reading, numerical operations, and word reading scores from the WIAT. The final level included non-ADHD comorbid diagnoses.

The first level of model predicting the first semester GPA of students with ADHD failed to reach statistical significance ($p = .056$; see Table 5 for intercorrelations between regression variables and Table 6 for regression statistics). The addition of educational factors resulted in a statistically significant change in R^2 , $F^{\Delta}(6, 86) = 2.929$, $p = .012$, uniquely accounting for 14.9% of the variance, with the whole model predicting 27.1% of the variance. The third block failed to significantly impact the total variance explained ($R^{2\Delta} = .16$, $p = .182$). Among coefficients, only gender significantly predicted first semester GPA for college students with ADHD ($\beta = -.265$, $p = .012$) such that being male was related to lower first semester GPA.

The regression analysis predicting the second semester GPA of students with ADHD

failed to reach statistical significance at all levels of analysis (p 's = .059, .061 .089 respectively). Intercorrelations of regression variables are reported in Table 7 and regression statistics are reported in Table 8.

The first level of the regression analysis predicting first semester GPA among college students without ADHD failed to reach statistical significance ($p = .157$; see Table 9 for intercorrelations between regression variables and Table 10 for regression statistics). The addition of educational factors resulted in a significant change in R^2 , $F^\Delta(6,109) = 10.568$, $p < .001$, uniquely accounting for 34.3% of the variance, with the whole model predicting 41.0% of the variance. The third level failed to significantly impact total variance explained ($R^{2\Delta} = .02$, $p = .497$). Among coefficients, high school GPA ($\beta = .404$, $p < .001$) and WIAT Essay Composition ($\beta = .165$, $p = .039$), positively and significantly predicted first semester GPA.

The first level of the regression analysis predicting second semester GPA among college students without ADHD was statistically significant, $R^2 = .117$, $F(5,115) = 3.057$, $p = .013$ accounting for 11.7% of the variance (see Table 11 for intercorrelations between regression variables and Table 12 for regression statistics). The addition of educational factors resulted in a significant change in R^2 , $F^\Delta(5,115) = 5.434$, $p < .001$, uniquely accounting for 20.3% of the variance, with the whole model predicting 32.1% of the variance. The third level failed to significantly impact total variance explained ($R^{2\Delta} = .03$, $p = .465$). Among coefficients, gender ($\beta = -.236$, $p = .007$), ethnicity ($\beta = .185$, $p = .047$) and high school GPA ($\beta = .378$, $p < .001$) significantly predicted second semester GPA. Specifically, being male predicted lower GPA, being Hispanic predicted higher GPA, and greater high school GPA values predicted higher second semester college GPAs.

To test if the magnitude of prediction was equal across students with and without ADHD

for each dependent variable, Fisher's Z-tests were conducted. Results of the Fisher's Z-test for first semester GPA failed to reach statistical significance ($z = 1.170, p > .05$). Similarly, the magnitude of prediction was equal across groups for second semester GPA ($z = 1.215, p > .05$). so, no real difference.

Finally, a seven-group MANCOVA was conducted to test the hypothesis that, controlling for medication use, students with ADHD and a comorbid mood or anxiety disorder would have lower GPAs relative to comparison students with and without clinical diagnoses. Mean GPAs for each group in each semester are displayed in Table 13. Results indicated a statistically significant effect of group (Wilks' $\Lambda = .899, F(12, 750) = 3.727, p < .001$, partial $\eta^2 = .056$). Follow-up ANOVAs indicated that groups differed for both first semester ($F[6,376] = 5.529, p < .001$ partial $\eta^2 = .081$) and second semester GPA ($F[6,376] = 2.583, p = .018$ partial $\eta^2 = .040$).

Results of the Bonferroni corrected pairwise comparisons indicated that, contrary to the initial hypothesis, students with ADHD and a mood disorder did not differ significantly from students without any clinical diagnoses (p 's = 1.0 & 1.0) or from students without ADHD but with another clinical diagnosis (p 's = 1.0 & 1.0) for either first-semester or second-semester GPA. . Contrary to the initial hypothesis that ADHD+Anxiety would be protective relative to ADHD alone, students with ADHD and an anxiety disorder had lower first-semester GPAs relative to comparison students without clinical diagnoses ($p = .01$; Cohen's $d = -.87$), but students with ADHD+Anxiety did not significantly differ from those with ADHD alone ($p = .669$). Further, the difference between the ADHD+Anxiety group and comparison students was not statistically significant for second-semester GPA ($p = 1.0$). Finally, results indicated that students with ADHD and two additional disorders obtained significantly lower first-semester GPAs relative to comparison students with ($p = .021$; Cohen's $d = -.63$) and without ($p < .001$;

Cohen's $d = -.77$) clinical diagnoses; however, these differences did not persist into the second semester (p 's = .561 & 1.0 respectfully)

Research Question Three

Descriptive statistics regarding the rate of service use by group are listed in Table 14. Percentage of students using any type of services ranged from 68.5% (ADHD alone) to 92.9% (ADHD + Anxiety). Inspection of the use percentages indicated that meetings with professors or advisors may be accounting for the high values, therefore a second use variable was calculated not counting meetings with professors or advisors. Rates of use ranged from 51.1% (ADHD Alone) to 77.8% (ADHD + Other; see Table 14). To evaluate differences in the rate of disability and academic support service use among students with or without ADHD and/or ADHD with comorbid conditions, a seven-group MANCOVA was initially planned. Prior to the analysis, data were checked for normality based upon skewness and kurtosis, normal probability plots and bivariate normality plots. Skewness and kurtosis for most variables were outside of the suggested range of -2 to +2 (see Table 15). A logarithmic transformation was conducted to normalize data; however, values for most variables were still outside the recommended range (see Table 15). Therefore, the six service use variables were collapsed into a single service use frequency variable to normalize the service use data. The resultant ANCOVA was checked for normality; however, Levene's test of equality of error variances was statistically significant. Therefore, the single service use variable was transformed using the log transformation (Field, 2009). Results of the transformation indicated that variances did not differ significantly among groups $F(6,413) = 1.956, p = .071$.

Descriptive statistics of the final ANCOVA are reported in Table 16. Results indicated that the groups did not statistically differ from each other in terms of service use $F(6,412) =$

2.012, $p = .063$ partial $\eta^2 = .099$. Given the possibility of decreased power due to small subgroup size, the analysis was rerun considering only four groups: ADHD only, ADHD with comorbid diagnosis, non-ADHD with at least one psychological diagnosis, and undiagnosed control. The result of this analysis was also not statistically significant $F(3,415) = 1.696$, $p = .167$.

Given the uniformly high report of meetings with professors and advisors and the possibility that such meetings may not represent the use of an academic service (i.e., students could meet with a professor and not receive any support), a third analysis was attempted using the log transformation of service use frequency of all services except meetings with professors or advisors. Results of this analysis indicated a statistically significant group difference on total service use ($F[6, 419] = 2.358$, $p = .030$, partial $\eta^2 = .033$). Follow-up unadjusted individual contrasts indicated that the ADHD + Mood group used services significantly more often relative to the comparison group ($p = .027$, $d = 0.46$) and the students with a non-ADHD diagnosis ($p = .041$, $d = 0.54$). Additionally, the ADHD + Other group used services more often relative to the comparison students ($p = .006$, $d = 0.82$), students with a non-ADHD diagnosis ($p = .009$, $d = 0.92$), students with ADHD only ($p = .012$, $d = 0.65$) and students with ADHD and at least two other diagnoses ($p = .016$, $d = 0.66$).

Research Question Four

To identify which variables predict service use in college, a backward step-wise multiple regression was performed. Descriptive statistics are listed in Table 17. Intercorrelations of regression variables are reported in Table 18 and regression statistics are reported in Table 19. Gender, ethnicity, race, parent education, parent job prestige, ADHD symptom severity, pre-college service use, first-year college GPA, group status, and comorbid diagnoses were entered

to predict total service use.

The final prediction model was selected following 10 iterations. The final model was statistically significant $F(2,389) = 17.264, p < .001$, and accounted for 8.2% of the total variance. There were two remaining statistically significant predictors: student race ($\beta = .141, p = .005$) and pre-college service use ($\beta = .275, p > .001$). Specifically, results indicated that being non-white and receiving pre-college academic services both predicted higher frequency of service use in college.

Research Question Five

Two hierarchical multiple regression analyses were used to evaluate if self-reported service use predicts improved academic outcomes at both the first and second semester for all students. In order to test the unique impact of service use, variables indicated in past research were entered in two blocks prior to the introduction of service use frequency. Blocks were grouped conceptually (i.e., demographic and educational) based upon available literature indicating the contribution of these variables to predicting academic performance. For both analyses, level 1 consisted of ADHD group status, race, ethnicity, highest parent job prestige, and highest parent education level. Level 2 consisted of high school GPA, SAT total score, IQ score, the WIAT numerical operations, word reading, and essay composition scale scores. Level 3 consisted of total service use frequency.

The first level of the model predicting first semester GPA was statistically significant ($F[5,214] = 4.703, p < .001$) accounting for 11.7% of the total variance. Descriptive statistics are listed in Table 20, intercorrelations of regression variables are reported in Table 21, and regression statistics are reported in Table 22. The addition of educational predictors was also statistically significant ($F^{\Delta}[6, 208] = 11.625, p < .001$) uniquely accounting for 22.3% of the

variance with 34.0% of the total variance explained. The addition of service use failed to result in statistically significant R^2 change ($F^\Delta[1,207] = 0.101, p = .751$). Gender ($\beta = -.141, p = .018$), high school GPA ($\beta = .332, p < .001$) and WIAT essay composition scale score ($\beta = .154, p = .010$) significantly predicted first semester GPA. Specifically, being male predicted lower first semester GPA while higher GPA in high school and higher WIAT essay composition scale scores predicted higher GPAs.

The first level of the model consisting of demographic variables predicting second semester GPA was statistically significant ($F [6,212] = 4.643, p < .001$) accounting for 11.6% of the total variance. Descriptive statistics are listed in Table 20, intercorrelations of regression variables are reported in Table 23, and regression statistics are reported in Table 24. The addition of educational predictors was also statistically significant ($F^\Delta [6,206] = 3.956, p > .001$) uniquely accounting for 9.1% of the variance with 20.7% of the total variance explained. The addition of service use failed to result in statistically significant R^2 change ($F^\Delta[1,205] = 0.068, p = .795$). Only gender ($\beta = -.209, p = .002$) and high school GPA ($\beta = .243, p < .001$) significantly predicted second semester GPA. Specifically, being male was associated with lower second semester GPA and higher high school GPAs were positively associated with higher second semester GPAs.

CHAPTER V

Discussion

The current study sought to expand the extant literature regarding college students with ADHD by (a) examining differences in high school and college GPA using a rigorously defined, multi-site sample; (b) identifying predictors of academic performance among students with and without ADHD; (c) investigating the rate of service use among students with and without ADHD; (d) identifying variables that may predict the use of university services; and (e) documenting the academic outcomes of service use during the first year of college.

Results indicated a small but statistically significant effect of ADHD status on GPA across time when controlling for medication status. Follow-up analyses indicated significant differences in GPA at all three time points; however, the magnitude of difference was reduced at each time point as evidenced by lower effect sizes.

With regard to predictors of GPA among students with ADHD, only gender significantly predicted first semester GPA such that males had lower GPAs relative to females. None of the regression models consisting of demographic and educational variables were significant in predicting second semester GPA among students with ADHD. Significant predictors among students without ADHD included high school GPA and WIAT essay composition scale scores for first semester GPA.. Specifically, higher high school GPAs and WIAT essay composition scale scores were associated with higher college GPAs. Among this group, being male was predictive of lower GPA and Hispanic predicted higher GPAs. Finally, the magnitude of prediction across groups was equal for both students with and without ADHD.

Interestingly, no differences emerged between students with and without ADHD and/or comorbid conditions regarding total service use; however, overall service use was relatively high

across groups. Both student race and pre-college service use significantly predicted college service use. Specifically, non-white students and those who had previously received support services were more likely to utilize campus services relative to white students. Finally, results indicated that the use of academic services on campus was not related to GPA during the first or second semester after controlling for demographic and educational variables. Alternatively, results did indicate that males had lower GPAs relative to females and both high school GPA and WIAT essay composition scale scores predicted higher first semester GPA, with only gender and high school GPA significantly predicting second semester GPA.

Research Question One Findings

Consistent with the initial hypothesis, results of the current study replicated past research indicating that students with ADHD earn lower high school and college GPAs relative to students without ADHD (Advokat et al., 2011; Heiligenstein et al., 1999; Lewandowski et al., 2008; 2013; Rabiner et al., 2008). Previous work with the TRAC sample indicated significant differences between students with and without ADHD on cumulative first-year GPA (Gormley et al., 2015); however, the current study is unique such that data were analyzed at three time points separately. Interestingly, the data suggest a trend such that the effect size of group differences on GPA shrinks over time, with the largest differences being evident in high school and the smallest effect sizes existing by the second semester of the first year at college.

The disparity between group GPAs replicates the larger literature detailing educational deficits among students with ADHD across the lifespan (DuPaul & Stoner, 2014; Weyandt & DuPaul, 2013). Active mechanisms may include deficits in executive functioning resulting in impairment in attention and focus during lectures or when completing homework assignments, deficits in organization and time management skills when planning extended assignments,

impulsive decisions to engage in more preferred activities in place of studying or completing academic assignments, or less effective approaches to engaging with academic material (Barkley, 2015; Barkley, et al., 2008; Fleming & McMahon, 2012; Simon-Dack, et al., 2014).

The reduction in effect size of GPA differences between high school and college is less clear. Although the present results replicate previous research documenting lower GPAs in the second semester of college relative to the first semester, students with ADHD demonstrated a smaller drop in GPA relative to students without ADHD. Theoretically, the greater demands on students to independently manage their time in addition to the likely loss of external supports (i.e., parents) should predict greater difficulties during college relative to high school (Meaux, Green, & Broussard, 2009).

Although the differences in effect sizes are moderate and potentially due to normal statistical variation, alternative explanations may be possible. First, students with ADHD had fewer available points to lose during the transition from high school to college while meeting minimal academic requirements. It is possible that the lower reduction among students with ADHD is a product of restricted range. Alternatively, individuals with ADHD have been documented as requiring higher level of rewards to achieve similar levels of behavioral inhibition relative to typically developing peers (Slusarek, Velling, Bunk, & Eggers, 2001). It is possible that college offers a higher level of reward relative to high school. For example, to the extent that students receive fewer graded assignments in college relative to high school this may increase the relative 'reward' of each assignment completed. Given that both groups were equivalent on measures of ability (e.g., full scale IQ), this 'motivational boost' among students with ADHD may explain the smaller relative decline in GPA, despite maintaining lower absolute GPAs relative to students without ADHD. The apparent narrowing of effect size may also be

explained by the reduced sample size available for this analysis. Specifically only 278 (61%) of the total 456 students were available for this analysis. It is possible that the students for whom data were not available differ from those for whom data were available and therefore the results of the present analysis may actually represent a high functioning sub-group of college students with ADHD.

Research Question Two Findings

With regard to predictors of GPA among students with ADHD, only gender significantly predicted first semester GPA, WIAT essay composition scale scores positively predicted second semester GPA, and being Hispanic was associated with lower GPA. Among students without ADHD, high school GPA and WIAT essay composition scale scores significantly predicted first semester GPA and gender, ethnicity, and high school GPA significantly predicted second semester GPA. These results partially confirm the initial hypothesis given that high school GPA, but not SAT scores, predicted college GPA. Further, in line with the hypothesis that traditional predictors of college GPA would be stronger among students without ADHD, high school GPA was only significant among comparison students. Additionally, visual examination of direct correlations with GPA indicated greater r values among comparison students relative to those with ADHD. Further, SAT score was only correlated with first semester GPA among students with ADHD, but was correlated with both first and second semester GPA among comparison students.

These findings replicate previous research indicating that females generally obtain higher GPAs than do males (Kuh et al., 2008; Langberg et al., 2014), potentially due to higher levels of self-discipline (Duckworth & Seligman, 2006). The present results were consistent with previous work suggesting that high school GPA is predictive of college GPA (Ackerman et al., 2013;

Belfield & Crosta, 2012; Hoffman & Lowitzki, 2005; Kuh et al., 2008). The present findings indicating a differential impact of ethnic and linguistic minority status are difficult to interpret. Among the ADHD group, results mirror those in previous studies suggesting a negative impact of self-reported ethnic and/or racial minority status (Hoffman and Lowitzki, 2005; Kuh et al., 2008). The reversal of this effect among non-ADHD students suggests that the relationship between ethnicity and GPA are more complex than previously thought and may warrant additional research. Such conclusions should be considered cautiously, however, given the non-significance of the larger regression model.

The emergence of essay composition as a significant predictor of GPA is similar to results released by The College Board in which SAT writing scores provided the strongest predictor of first-year GPA among the SAT subsections (Mattern, Patterson, Shaw, Kobrin, & Barbuti). Additionally, many colleges require students to take writing seminars during their first or second semesters. Given that the basis for evaluation in these courses is the quality of the student's writing, it is not surprising that essay composition scale scores would be predictive of GPA during the first year of college.

Contrary to the original hypothesis and past work, SAT score did not emerge as a significant predictor of first-year GPA (Ackerman et al., 2013; Hoffman & Lowitzki, 2005; Kuh et al., 2008). The current results may differ from the previous literature due to the addition of other variables that may account for the variance that would otherwise be expressed within the SAT score. For example, none of the previous studies included student's FSIQ score, which was significantly related to both GPA and SAT score. Additionally, the current analysis included the WIAT achievement scores for word reading and numerical operations, which may have captured variance that would have otherwise been attributed to the SAT score. The present analysis may

represent the most robust and unique predictors of first-year GPA at the fall and spring semesters.

Research Question Three Findings

Results indicated significantly higher rates of service use among participants relative to previous research reporting 45% of students using services (i.e., Chew et al., 2009). Percentage of students using services remained high even when removing advisor meetings that included seeking help on a specific assignment or discussing a poor test grade relative to other service categories that may better represent academic services (e.g., tutoring). The higher rate of service utilization may be due to both a larger and more diverse sample. Specifically, Chew and colleagues reported on 196 students at a single 4-year institution. Available services at that institution may have limited student usage resulting in a lower reported rate of use.

Interestingly, the present results found few differences in service use among students with ADHD alone, students without ADHD but another psychiatric condition, and students with no psychiatric diagnoses. Effect sizes were all below 0.2 suggesting a very small, and statistically nonsignificant impact of ADHD status on service use. Among the ADHD groups, highest total service use was observed among students with ADHD + Anxiety when considering advisor meetings and ADHD + Other when not considering advisor meetings. Although the present results provide a descriptive picture of service use among college students with and without ADHD and comorbid conditions, strong conclusions regarding group differences cannot be made at the service type level due to significantly non-normal data requiring services to be collapsed into a single variable.

The differences in service use that emerged when professor/advisor meetings were removed appear to be driven by the ADHD + Other group and the ADHD + Mood group. The

ADHD + Other group had effect sizes ranging from small (.24) to large (.92) with most effect sizes falling in the moderate range. The ADHD + Mood group had small (.09) to moderate (.54) effects with the majority falling within the small range. Although both groups differed relative to students without ADHD, only the ADHD + Other group differed from students with ADHD alone, and ADHD + multiple diagnoses. Examination of the specific services utilized indicates the highest consumers of academic services are students with ADHD and another (non-anxiety, non-mood) disability. Most often, the other diagnosis was a learning disability, which has been previously associated with higher rates of service use (Pollack et al., 2015). The failure of the ADHD + Anxiety group to emerge as significantly different relative to the other groups despite the second highest rate of service use is less clear; however, this group was quite small ($n = 11$) and therefore the results for this group should be considered cautiously. More broadly, the results may represent a timing effect. Specifically, given that the present study only uses data from students' first year at college, it is possible that at the time of evaluation, students were not aware of nor needed academic supports.

Research Question Four Findings

The ability of the present findings to adequately predict service use is limited with the final model accounting for just 8% of the total variance. Nevertheless, among available predictors, student race and pre-college service use were significantly predictive of college service use. Although no known previous data exist to guide interpretation, the emergence of pre-college service use as the strongest predictor of college service use is not surprising given the proportion of students who qualify for services in college such as formal disability support services is higher among students who previously have utilized services (i.e., have a diagnosed disability). The predictive effect of race on service use is more difficult to interpret. Although no

previous research is available regarding the use of academic services specifically, extrapolation from the extant literature suggest the present findings are a departure from previous findings suggesting that racial minorities are less likely to be both diagnosed with a disorder and less likely to seek out services for specific difficulties (Morgan et al., 2013; Snowden, 2003). This departure may be explained by evidence suggesting that individuals with higher levels of education use support services to a greater degree relative to those with less education (Olfson, Marcus, Druss & Pincus, 2002). Given that the present sample consists of only first-year college students, previous research detailing the service use patterns of racial minorities may not be as applicable.

Research Question Five Findings

Contrary to initial hypotheses, results suggested that service use during college did not independently predict GPA during the first or second semester of students' first year at college. There are several potential explanations for the divergence of the present findings from the previous literature. First, previous findings did not consider the range of factors included in the current analysis. For example, Matthews et al. (2013) examined the impact of math support centers without controlling for additional variables such as student full scale IQ, high school GPA or other academic achievement scores. The present analysis is a more rigorous analysis of academic support services and may highlight the limitations of current academic support services to independently impact academic functioning. Alternatively, there remains some equivocation regarding the impact of simply utilizing academic services void of quality information (i.e., quality of service or level of student participation with offered services; Pell & Croft, 2008). Given that the present study did not collect data regarding the quality of the services offered nor the amount of engagement within sessions by the students reporting having used each service, it

is possible that these findings represent the minimal effectiveness of college academic support services.

Limitations

The current findings must be evaluated in light of the limitations of the study design. First, the present sample consists only of students enrolled at four-year institutions. Less than one-third of individuals with ADHD attend such institutions (Kuriyan et al., 2013). Second, GPA data were obtained through a combination of archival sources and self-report. Although it is unclear how these multiple methods may have influenced analyses, confidence in the GPA outcomes is lower given the partial reliance on self-report. Third, the reliance on self-report prohibits accurate analysis of service use given that students may report services they did not actually receive or fail to report services that they did receive. Further, the present analysis does not facilitate measurement of the quality of student participation in available services nor the quality of the services themselves. Specifically, it is possible that students only superficially participated in the services available to them on their individual campus. Similarly, the current analysis does not offer any validation regarding the quality of services utilized by students in the present study. Therefore, definitive conclusions regarding service use cannot be drawn from the present analysis.

Data limitations, specifically the non-normality of the service use data, prohibited a detailed analysis of service utilization. This limitation is pertinent given the failure to identify a significant relationship between service use and GPA. Specifically, it is possible that an individual service is particularly effective for increasing GPA; however, the present analysis does not allow for such detailed analysis. It is possible that by grouping all services into a single variable, significant effects of a given service were masked. Additionally, the present analyses

were constrained by missing data. The variable sample sizes were limiting in two ways. First, although the majority of students appeared in all analyses, the variability in the sample at the analysis level limits conclusions drawn across all analyses given the variation in sample compositions between each analysis. Second, given data were collected at different time points, it is possible that outcome data such as GPA data are skewed due to students not returning for the follow-up meeting. Presumably, students who failed to return, particularly those in the ADHD group may represent a more impaired sub-sample of the larger ADHD group resulting in skewed results in the present analysis. In addition to small sample size, GPA differences analyzed by comorbidity group were significantly limited by cell size with two groups including less than 20 participants. Given these small cell sizes, results should be interpreted cautiously. Similarly, the present study utilized only year one data from the larger TRAC study. As such, the present findings are incomplete with regard to the larger college experience and may not generalize to college students beyond their first year.

With regard to predicting differences in service utilization, the present study is limited in the specific disabilities investigated. For example, the ADHD + Other group was primarily comprised of students with ADHD and a specific learning disability, but also included other disabilities such as eating disorders. This eclectic 'other' category prohibits detailed analysis of results relating to specific disabilities. For example, although higher disability service utilization is hypothesized to be due to the high percentage of students with learning disabilities, it is possible that another disability classification (e.g., eating disorders) may account for higher service utilization. This investigation is also limited in the types of services investigated. It is possible that students received additional supports not captured in the present analysis or did not have all services available to them.

Implications for Future Research

The results and limitations of the present study suggest the need for additional research regarding the use and effectiveness of academic services for college students with and without ADHD. First, future research should monitor the quality of engagement with support services by students with ADHD. Mac an Bhaird and colleagues (2009) reported that although visiting mathematics tutoring center was associated with higher mathematics scores, tutoring is only a supplemental support to the student's own motivation to independently master the material. Future research should consider the roles of student's specific study habits in conjunction with service use to detect potential mediators or moderators of effective services. Finally, future research should continue to investigate promising interventions (e.g., CBT based coaching) to provide evidence-based practices for college students with ADHD.

The impact of student engagement with services is predicated on the quality of the services offered. Future research would ideally include measures of service integrity when interpreting the outcomes of service use. Additionally, student service use would be best understood within the context of services offered at their institution. In addition to measure of quality, knowledge of what services are offered at a given institution may provide a better picture of a student's service use within the context of available services.

Those students with ADHD enrolled in a four-year institutions have been considered the highest functioning subgroup of the ADHD population (Kuriyan et al., 2013). Therefore, future investigations should compare those individuals with ADHD across institution type (e.g., vocational, community and four-year schools). Similarly, future research should identify how data from a student's first year in college predicts later college functioning.

The present analysis identified a limited number of predictors for first year GPA, and

among students with ADHD, these predictors were mostly immutable (i.e., gender and ethnicity). Future work should examine a broader range of predictors for academic success in college. For example, student study habits or level of motivation to succeed academically may better predict student GPA relative to the traditional predictors of high school GPA and writing scores alone. It is also important that future studies investigate predictors of GPA beyond the first year of college. Such information could be informative for admissions decisions, and may also allow for the development of meaningful accommodations and interventions that can be provided on college campuses to assist students with ADHD and other difficulties succeed both during college and beyond their college experience.

Implications for Practice

The current study also has direct implications for practice. First, the present results suggest that the standard predictors for success in college (e.g., SAT scores, High School GPA) do not significantly predict first-year GPA for students with ADHD. In fact, only gender was independently predictive of GPA among this population. When making admissions decisions, colleges may decide to place less emphasis on these factors in favor of other metrics such as writing ability. Second, the current results suggest that colleges may need to increase their outreach to students who would benefit from additional supports. Specifically, only student race and prior service use were predictive of academic service use. The failure of both ADHD and disability status to predict service use indicates that those students at the highest need for support may not be receiving the quality supports they require. Colleges may wish to adopt a more proactive model of service delivery by including structured organizational management training into freshmen orientations, providing evaluations for formal accommodations on campus at no cost to the student, and requiring the use of formal (e.g., coaching) or informal (e.g., writing

center) supports for students at risk for or on academic probation. Given that students with ADHD are more likely to struggle academically, such policies would likely lead to increased usage among this population. Finally, the present findings also suggest that colleges should seek to replace less effective services (e.g., extended time) with more promising services for students with ADHD (e.g., coaching) in order to make meaningful impacts on the functioning of students with ADHD.

Conclusion

Despite these limitations, and the need for additional research, the current findings make substantive contributions to the extant literature in several ways. First, the current study demonstrated significantly lower GPAs among a rigorously defined, multi-site sample of first year college students with ADHD relative to students without ADHD. Second, this study indicated that traditional predictors of college success may be less meaningful for students with ADHD. Third, ADHD combined with other disorders but not ADHD alone predicted higher rates of service use relative to students without ADHD. Finally, the present results suggest that typically available academic services are not independently related to GPA among first-year college students with or without ADHD.

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Table 1

Demographic Data

Average Age (<i>SD</i>)	18.23 (.524)
Gender (Female)	51.8%
ADHD Status	50%
Ethnicity (Hispanic)	10.3%
Race	
Caucasian	71.7%
African American	12.3%
Asian	5.5%
More than 1	3.9%
Other	6.6%

Table 2

Sample Size by Analysis

Analysis	Total <i>N</i>	ADHD	Comparison
Group GPA Differences	278	133	145
Predictors of GPA	220	99	121
Rate of Service Use	420	204	216
Predictors of Service Use	393	194	199
Outcomes of Service Use	220	99	121

Table 3

Means and Standard Deviations of GPAs by Group

	<u>Group</u>	<u>N</u>	<u>M (SD)</u>
High School GPA	ADHD	133	3.45 (.47)
	Comparison	145	3.82 (.47)
	Total	278	3.65 (.50)
Fall Semester GPA	ADHD	133	2.91 (.80)
	Comparison	145	3.25 (.66)
	Total	278	3.09 (.75)
Spring Semester GPA	ADHD	133	2.83 (.86)
	Comparison	145	3.13 (.77)
	Total	278	2.99 (.83)

Table 4

Means, Standard Deviations and Effect Size by Group

	<u>ADHD <i>M</i> (<i>SD</i>)</u>	<u>Control <i>M</i> (<i>SD</i>)</u>	<u><i>t</i> or χ^2</u>	<u>Cohen's <i>d</i></u>
Fall GPA	2.91 (.77)	3.26 (.69)	-4.92***	-0.48
Spring GPA	2.79 (.84)	3.13 (.82)	-3.79***	-0.41
Gender (% Male)	55% (.50)	45% (.50)	0.04	0.20
Ethnicity (% Non-Hispanic)	91% (.29)	89% (.31)	0.02	0.07
Race (% White)	79% (.41)	69% (.46)	5.72*	0.23
Parent Ed	5.5 (1.09)	4.82 (1.45)	2.21*	0.53
Parent Job	79.62 (21.61)	75.12 (21.90)	1.66	0.21
ADHD Med Status (% Medicated)	48% (.50)	NA	NA	NA
HS GPA	3.44 (.50)	3.82 (.46)	-6.06***	-0.79
SAT Tot	1177.37 (186.17)	1190.66 (179.78)	-0.63	-0.07
FSIQ Score	111.22 (13.24)	111.73 (11.04)	0.29	-0.04
Word Reading	109.84 (6.28)	109.96 (5.98)	-1.49	-0.02
Numerical Operations	109.69 (14.67)	113.41 (13.97)	-2.99**	-0.26

Continued

Table 4 Continued

	<u>ADHD <i>M</i> (<i>SD</i>)</u>	<u>Control <i>M</i> (<i>SD</i>)</u>	<u><i>t</i> or χ^2</u>	<u>Cohen's <i>d</i></u>
Essay Composition	113.47 (11.24)	116.78 (10.17)	-2.25*	-0.31
Diagnoses	1.00 (1.01)	0.21 (.55)	10.26***	0.97

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; ADHD Med Status = ADHD medication status; HS GPA = high school GPA; SAT Tot = SAT total score; FSIQ score = WASI full scale IQ score estimate; Word Reading = WIAT word reading standard score; Numerical Operations = WIAT numerical operations standard score; Essay Composition = WIAT numerical operations standard score; Diagnoses = number of non-ADHD psychiatric conditions.

Table 5

Intercorrelations Between the Multiple Regression Variables for First Semester GPA Among College Students With ADHD

1 st GPA													
Gender	-.263**												
Ethnicity	-.136	.077											
Race	-.066	.126	.266**										
Par. Ed	.187*	-.077	.041	.022									
Par. Job	.146	-.031	.002	.032	.459***								
ADHD Med	.002	-.007	-.026	-.256**	.071	.132							
HS GPA	.378***	-.204*	-.026	-.008	.174*	.125	-.007						
FSIQ	.239**	.025	.072	.003	.184*	.149	.100	.230*					
SAT Tot	.296**	.150	-.005	-.071	.309**	.317***	.148	.376***	.573***				
Word Read	.156	.028	.014	-.240**	.284**	.067	.032	.175*	.294**	.460***			
Num. Ops.	.221*	.111	.125	-.072	.262**	.222*	.244**	.224*	.426***	.673***	.277**		
Essay Comp	.215*	-.092	-.039	-.015	-.025	.011	-.213*	.200*	-.028	.076	.085	.133	
Diagnoses	-.054	-.312**	-.151	-.134	.023	-.082	.003	-.116	.061	-.197*	.089	-.214*	.112

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; Par Ed = highest parent educational level; Par Job = highest parent occupational prestige score; ADHD Med = ADHD medication status; HS GPA = high school GPA; FSIQ = WASI full scale IQ estimate; SAT TOT = SAT

total score; score; Word Read = WIAT word reading standard score; Num Ops = WIAT numerical operations standard score; Essay
Comp = WIAT numerical operations standard score; Diagnoses = number of non-ADHD psychiatric conditions.

Table 6

Regression Statistics for Model Predicting First Semester GPA Among Students with ADHD

Model	Variable	<i>R</i> / <i>B</i>	<i>R</i> ² / β	<i>SE</i>	<i>p</i> -Value	ANOVA <i>F</i>	Model <i>p</i>
1		.350	.123	.748	.056	2.142	.056
	Gender	-.384	-.248	.153	.014		
	Ethnicity	-.321	-.120	.272	.241		
	Race	-.030	-.016	.199	.881		
	Parent Ed	.114	.161	.078	.147		
	Parent Job	.002	.069	.004	.537		
	ADHD Med Status	-.043	-.028	.158	.788		
2		.521	.271	.705	.012	2.670	.004
	Gender	-.349	-.226	.154	.026		
	Ethnicity	-.337	-.126	.263	.204		
	Race	.003	.001	.197	.989		
	Parent Ed	.062	.087	.078	.431		
	Parent Job	.000	.009	.004	.937		
	ADHD Med Status	-.034	-.022	.158	.830		
	HS GPA	.318	.205	.164	.056		
	FSIQ	.006	.103	.007	.369		
	SAT Total	.001	.126	.001	.440		
	Word Reading	-.001	-.011	.014	.924		
	Num. Operations	.003	.053	.007	.689		
	Essay Comp.	.009	.132	.007	.186		
3		.535	.287	.702	.182	2.627	.004
	Gender	-.410	-.265	.160	.012		
	Ethnicity	-.382	-.143	.264	.151		
	Race	-.009	-.005	.196	.964		
	Parent Ed	.074	.104	.078	.350		
	Parent Job	.000	-.001	.004	.993		
	ADHD Med Status	-.018	-.012	.158	.910		
	HS GPA	.276	.178	.166	.100		
	FSIQ	.008	.143	.007	.229		
	SAT Total	.000	.093	.001	.568		
	Word Reading	.001	.011	.014	.921		
	Num. Operations	.001	.025	.007	.852		
	Essay Comp.	.011	.158	.007	.121		
	Diagnoses	-.128	-.145	.095	.182		

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational

prestige score; ADHD Med Status = ADHD medication status; HS GPA = high school GPA;

FSIQ = WASI full scale IQ score; SAT TOT = SAT total score; Word Reading = WIAT word

reading standard score; Numerical Operations = WIAT numerical operations standard score;
Essay Composition = WIAT numerical operations standard score; Diagnoses = number of non-
ADHD psychiatric conditions.

Table 7

Intercorrelations Between the Multiple Regression Variables for Second Semester GPA Among College Students With ADHD

2 nd GPA													
Gender	-.243**												
Ethnicity	-.251**	.074											
Race	-.091	.121	.264**										
Par. Ed	-.046	-.023	.037	.015									
Par. Job	.052	-.049	-.033	.025	.447***								
ADHD Med	-.034	-.018	-.029	-.263**	.057	.119							
HS GPA	.176*	-.231*	-.033	-.018	.152	.099	-.026						
FSIQ	.041	.010	.068	-.004	.168*	.131	.088	.211*					
SAT Tot	.004	.136	-.010	-.080	.294**	.302***	.136	.359***	.565***				
Word Read	.033	.034	.015	-.238**	.294**	.075	.037	.189*	.304**	.473***			
Num. Ops.	.045	.093	.121	-.083	.243**	.200*	.231*	.196*	.412***	.665***	.292**		
Essay Comp	.281**	-.083	-.036	-.011	-.013	.024	-.206*	.222*	-.017	.090	.081	.152	
Diagnoses	.124	-.301**	-.148	-.128	.044	-.061	.017	-.091	.082	-.179*	.083	-.193*	.101

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; ADHD Med Status = ADHD medication status; HS GPA = high school GPA; FSIQ score = WASI full scale IQ score;

SAT TOT = SAT total score; Word Reading = WIAT word reading standard score; Numerical Operations = WIAT numerical operations standard score; Essay Composition = WIAT numerical operations standard score; Diagnoses = number of non-ADHD psychiatric conditions.

Table 8

Regression Statistics for Model Predicting Second Semester GPA Among Students with ADHD

Model	Variable	<i>R</i> / <i>B</i>	<i>R</i> ² / β	<i>SE</i>	<i>p</i> -Value	ANOVA <i>F</i>	Model <i>p</i>
1		.350	.122	.812	.059	2.116	.059
	Gender	-.374	-.223	.167	.027		
	Ethnicity	-.659	-.228	.295	.028		
	Race	-.039	-.019	.217	.857		
	Parent Ed	-.058	-.075	.085	.495		
	Parent Job	.003	.081	.004	.465		
	ADHD Med Status	-.091	-.055	.172	.596		
2		.450	.203	.801	.214	1.800	.061
	Gender	-.289	-.172	.177	.106		
	Ethnicity	-.711	-.246	.299	.020		
	Race	.008	.004	.223	.971		
	Parent Ed	-.075	-.097	.089	.402		
	Parent Job	.003	.087	.004	.445		
	ADHD Med Status	-.016	-.010	.180	.928		
	HS GPA	.164	.096	.191	.392		
	FSIQ	.005	.084	.008	.485		
	SAT Total	-.001	-.171	.001	.313		
	Word Reading	.007	.053	.016	.657		
	Num. Operations	.006	.110	.008	.427		
	Essay Comp.	.017	.228	.008	.033		
3		.450	.203	.806	.892	1.644	.089
	Gender	-.282	-.168	.185	.132		
	Ethnicity	-.706	-.244	.303	.022		
	Race	.009	.005	.225	.967		
	Parent Ed	-.076	-.099	.090	.399		
	Parent Job	.003	.088	.004	.444		
	ADHD Med Status	-.018	-.011	.181	.921		
	HS GPA	.169	.099	.195	.389		
	FSIQ	.005	.080	.008	.523		
	SAT Total	-.001	-.168	.001	.331		
	Word Reading	.007	.050	.016	.676		
	Num. Operations	.007	.113	.008	.424		
	Essay Comp.	.017	.225	.008	.039		
	Diagnoses	.015	.015	.110	.892		

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational

prestige score; ADHD Med Status = ADHD medication status; HS GPA = high school GPA;

FSIQ score = WASI full scale IQ score; SAT Total = SAT total score; Word Reading = WIAT

word reading standard score; Numerical Operations = WIAT numerical operations standard score; Essay Composition = WIAT numerical operations standard score; Diagnoses = number of non-ADHD psychiatric conditions.

Table 9

Intercorrelations Between the Multiple Regression Variables for First Semester GPA Among College Students Without ADHD

1 st GPA												
Gender	-.056											
Ethnicity	-.002	.172*										
Race	-.090	.090	.407***									
Par. Ed	.202*	.136	-.215**	-.177*								
Par. Job	.013	.034	-.075	-.007	.480***							
HS GPA	.536***	-.044	-.140	-.066	.076	-.007						
FSIQ	.242***	-.029	-.152*	-.143	.267**	.179*	.232**					
SAT Tot	.434***	-.053	-.250**	-.161*	.459***	.213**	.385***	.530***				
Word Read	.240**	.110	-.101	-.297***	.084	-.016	.233**	.304***	.320***			
Num. Ops.	.351***	-.002	.011	.025	.311***	.208*	.325***	.309***	.623***	.211*		
Essay Comp	.258**	.138	-.027	-.170*	.063	-.013	.181*	-.034	.092	.204*	.048	
Diagnoses	.061	-.203*	-.026	-.091	-.237**	-.169*	.076	.133	-.002	.065	-.091	-.111

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; ADHD Med Status = ADHD medication status; HS GPA = high school GPA; FSIQ score = WASI full scale IQ score; SAT Tot = SAT total score; Word Reading = WIAT word reading standard score; Numerical Operations = WIAT numerical

operations standard score; Essay Composition = WIAT numerical operations standard score; Diagnoses= number of non-ADHD psychiatric conditions.

Table 10

Regression Statistics for Model Predicting First Semester GPA Among Students Without ADHD

Model	Variable	<i>R</i> / <i>B</i>	<i>R</i> ² / β	<i>SE</i>	<i>P</i> -Value	ANOVA <i>F</i>	Model <i>P</i>
1		.257	.066	.677	.157	1.630	.157
	Gender	-.137	-.100	.128	.285		
	Ethnicity	.210	.095	.224	.350		
	Race	-.107	-.072	.148	.471		
	Parent Ed	.130	.276	.051	.012		
	Parent Job	-.003	-.109	.003	.293		
2		.640	.410	.553	<.001	6.879	<.001
	Gender	-.129	-.094	.108	.234		
	Ethnicity	.361	.164	.189	.058		
	Race	-.041	-.027	.128	.752		
	Parent Ed	.061	.129	.046	.183		
	Parent Job	-.003	-.084	.003	.326		
	HS GPA	.612	.408	.125	.000		
	FSIQ	.001	.018	.006	.837		
	SAT Total	.001	.201	.000	.094		
	Word Reading	.004	.039	.010	.646		
	Num. Operations	.002	.048	.005	.627		
	Essay Comp.	.011	.159	.005	.045		
3		.642	.412	.554	.497	6.310	<.001
	Gender	-.118	-.086	.109	.281		
	Ethnicity	.357	.162	.189	.062		
	Race	-.032	-.022	.129	.803		
	Parent Ed	.067	.142	.047	.152		
	Parent Job	-.003	-.080	.003	.351		
	HS GPA	.606	.404	.125	<.001		
	FSIQ	.001	.009	.006	.919		
	SAT Total	.001	.197	.000	.101		
	Word Reading	.004	.037	.010	.662		
	Num. Operations	.003	.054	.005	.585		
	Essay Comp.	.011	.165	.005	.039		
	Comorbid Dx	.056	.055	.082	.497		

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational

prestige score; ADHD Med Status = ADHD medication status; HS GPA = high school GPA;

FSIQ score = WASI full scale IQ score; SAT Total = SAT total score; Word Reading = WIAT

word reading standard score; Numerical Operations = WIAT numerical operations standard

score; Essay Composition = WIAT numerical operations standard score; Comorbid Dx = number of non-ADHD psychiatric conditions.

Table 11

Intercorrelations Between the Multiple Regression Variables for Second Semester GPA Among College Students Without ADHD

2 nd GPA												
Gender	-.253**											
Ethnicity	-.014	.166*										
Race	-.106	.096	.416***									
Par. Ed	.171*	.104	-.215**	-.143								
Par. Job	.081	-.022	-.063	.040	.474***							
HS GPA	.450***	-.058	-.131	-.059	.110	.077						
FSIQ	.226**	-.040	-.150	-.134	.272**	.200	.243**					
SAT Tot	.352***	-.061	-.242**	-.160*	.469***	.256*	.398***	.536***				
Word Read	.066	.141	-.104	-.321***	.067	-.080	.172**	.278**	.275**			
Num. Ops.	.244**	-.012	.017	.027	.325***	.247**	.344***	.320***	.631***	.172*		
Essay Comp	.039	.147	-.032	-.172*	.041	-.037	.158*	-.045	.089	.218**	.047	
Diagnoses	.126	-.209*	-.026	-.084	-.237**	-.151*	.083	.134	.005	.057	-.083	-.118

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; ADHD Med Status = ADHD medication status; HS GPA = high school GPA; FSIQ score = WASI full scale IQ score; SAT TOT = SAT total score; Word Reading = WIAT word reading standard score; Numerical Operations = WIAT numerical

operations standard score; Essay Composition = WIAT numerical operations standard score; Diagnoses= number of non-ADHD psychiatric conditions.

Table 12

Regression Statistics for Model Predicting Second Semester GPA Among Students Without

ADHD

Model	Variable	<i>R</i> / <i>B</i>	<i>R</i> ² / β	<i>SE</i>	<i>p</i> -Value	ANOVA <i>F</i>	Model <i>p</i>
1		.342	.117	.782	.013	3.057	.013
	Gender	-.467	-.287	.147	.002		
	Ethnicity	.313	.119	.260	.231		
	Race	-.170	-.096	.173	.328		
	Parent Ed	.125	.222	.059	.035		
	Parent Job	-.001	-.020	.004	.844		
2		.566	.321	.705	<.001	4.675	<.001
	Gender	-.401	-.246	.137	.004		
	Ethnicity	.491	.187	.241	.044		
	Race	-.172	-.097	.166	.303		
	Parent Ed	.068	.121	.057	.241		
	Parent Job	-.002	-.044	.003	.630		
	HS GPA	.673	.383	.156	<.001		
	FSIQ	.003	.038	.007	.694		
	SAT Total	.001	.187	.001	.146		
	Word Reading	-.006	-.041	.012	.652		
	Num. Operations	-.002	-.042	.006	.692		
	Essay Comp.	-.001	-.007	.007	.936		
3		.569	.324	.707	.465	4.312	<.001
	Gender	-.385	-.236	.140	.007		
	Ethnicity	.485	.185	.242	.047		
	Race	-.163	-.092	.167	.332		
	Parent Ed	.076	.136	.059	.196		
	Parent Job	-.001	-.040	.003	.663		
	HS GPA	.663	.378	.157	<.001		
	FSIQ	.002	.028	.007	.777		
	SAT Total	.001	.183	.001	.158		
	Word Reading	-.006	-.043	.012	.637		
	Num. Operations	-.002	-.035	.006	.746		
	Essay Comp.	.000	.000	.007	.995		
	Diagnoses	.077	.063	.105	.465		

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational

prestige score; ADHD Med Status = ADHD medication status; HS GPA = high school GPA;

FSIQ score = WASI full scale IQ score; SAT Total = SAT total score; Word Reading = WIAT

word reading standard score; Numerical Operations = WIAT numerical operations standard score; Essay Composition = WIAT numerical operations standard score; Diagnoses = number of non-ADHD psychiatric conditions.

Table 13

Mean, Standard Deviation, and Group Comparisons of GPA by Group and Semester

	Reference	Comparison	Difference	<i>p</i>	Cohen's <i>d</i>
First Semester	Control (<i>M</i> = 3.27; <i>SD</i> = .67)	Dxd Control	.061	1.00	0.097
		Pure ADHD	.307	.257	0.333
		ADHD + Mood	.185	1.00	0.199
		ADHD + Anxiety	.832	.010	0.862
		ADHD + Other	.543	.167	0.696
		ADHD + Multiple	.618	.000	0.763
	Dxd Control (<i>M</i> = 3.20; <i>SD</i> = .77)	Pure ADHD	.246	1.00	-0.097
		ADHD + Mood	.124	1.00	0.093
		ADHD + Anxiety	.771	.072	0.754
		ADHD + Other	.481	.883	0.551
		ADHD + Multiple	.557	.021	0.633
		Pure ADHD (<i>M</i> = 3.03; <i>SD</i> = .77)	ADHD + Mood	-.122	1.00
	ADHD + Anxiety		.525	.669	0.576
	ADHD + Other		.236	1.00	0.32
	ADHD + Multiple		.311	.624	0.422
	ADHD + Mood (<i>M</i> = 3.13; <i>SD</i> = .73)	ADHD + Anxiety	.647	.260	0.692
		ADHD + Other	.357	1.00	0.468
		ADHD + Multiple	.432	.164	0.559
	ADHD + Anxiety (<i>M</i> = 2.48; <i>SD</i> = 1.11)	ADHD + Other	-.289	1.000	-0.348
		ADHD + Multiple	-.214	1.000	-0.213
ADHD + Other (<i>M</i> = 2.80; <i>SD</i> = .68)	ADHD + Multiple (<i>M</i> = 2.69; <i>SD</i> = .84)	.075	1.000	0.144	

Continued

Table 13 Continued

	Reference	Comparison	Difference	<i>p</i>	Cohen's <i>d</i>
Second Semester	Control (<i>M</i> = 3.13; <i>SD</i> = .80)	Dxd Control	-.129	1.00	-0.079
		Pure ADHD	.341	.240	0.354
		ADHD + Mood	.100	1.00	0.128
		ADHD + Anxiety	.345	1.00	0.425
		ADHD + Other	.651	.082	0.709
		ADHD + Multiple	.283	1.00	0.405
	Dxd Control (<i>M</i> = 3.19; <i>SD</i> = .71)	Pure ADHD	.470	.280	0.45
		ADHD + Mood	.229	1.00	0.207
		ADHD + Anxiety	.474	1.00	0.522
		ADHD + Other	.779	.060	0.82
		ADHD + Multiple	.411	.561	0.505
		Pure ADHD (<i>M</i> = 2.84; <i>SD</i> = .84)	ADHD + Mood	-.241	1.00
	ADHD + Anxiety		.003	1.00	0.081
	ADHD + Other		.309	1.00	0.358
	ADHD + Multiple		-.059	1.00	0.048
	ADHD + Mood (<i>M</i> = 3.02; <i>SD</i> = .92)	ADHD + Anxiety	.245	1.00	0.276
		ADHD + Other	.551	.524	0.541
		ADHD + Multiple	.183	1.00	0.251
	ADHD + Anxiety (<i>M</i> = 2.77; <i>SD</i> = .89)	ADHD + Other	.306	1.00	0.27
		ADHD + Multiple	-.062	1.00	-0.035
ADHD + Other (<i>M</i> = 2.53; <i>SD</i> = .89)	ADHD + Multiple (<i>M</i> = 2.80; <i>SD</i> = .83)	-.368	1.00	-0.314	

Note: Dxd Control = control with a non-ADHD clinical diagnosis; ADHD + Mood = diagnosis of ADHD and at least one mood disorder; ADHD + Anxiety = diagnosis of ADHD and at least one anxiety disorder; ADHD + Other = diagnosis of ADHD and one other disorder; ADHD + Multiple = diagnosis of ADHD and two or more disorders.

Table 14

Percentage of Students Using Services by Group

<u>Service</u>	<u>Control%</u>	<u>Dx'd Control%</u>	<u>ADHD%</u>	<u>ADHD+Mood%</u>	<u>ADHD+Anxiety%</u>	<u>ADHD+Other%</u>	<u>ADHD+Multiple%</u>
Any	75.0	86.1	68.5	69.0	92.9	88.9	77.4
Advisor Meeting	58.0	80.0	66.7	47.4	84.6	82.4	67.2
Any (Not Advisor)	58.6	60.0	60.3	73.7	76.9	82.4	56.9
Tutoring	41.4	34.3	33.3	44.7	53.8	41.2	36.2
Academic Skills	14.4	22.9	17.9	26.3	23.1	23.5	24.1
Writing/Speaking	18.2	17.1	19.2	39.5	30.8	29.4	27.6
Career Counseling	16.6	11.4	16.7	18.4	7.7	0.0	8.6
Disability Services	2.2	5.7	21.8	28.9	23.1	58.8	20.7

Note: Dx'd Control = Comparison student meeting criteria for a non-ADHD psychiatric condition; Any (not Advisor) = percent of students who used any service other than meeting with a professor or advisor; ADHD+Other = student meeting criteria for ADHD and another psychiatric condition besides mood or anxiety disorders; ADHD+Multiple = student meeting criteria for ADHD and more than one other type of disorder.

Table 15

Skewness and Kurtosis Values for Academic Service Use Variables

<u>Original Variables</u>	<u>Skewness</u>	<u>Kurtosis</u>
Advisor Meetings	0.511	-1.033
Campus Tutoring	1.024	-0.575
Academic Skills Assistance	2.509	5.081
Writing/Speaking Assistance	2.648	7.458
Career Counseling	3.590	2.692
Disability Services	14.801	5.865
<u>Log Transformed Variables</u>		
Advisor Meetings	0.160	-1.483
Campus Tutoring	0.855	-1.031
Academic Skills Assistance	2.198	3.407
Writing/Speaking Assistance	1.957	2.816
Career Counseling	2.739	6.920
Disability Services	2.534	4.792

Table 16

Mean, Standard Deviation, and Group Comparisons of Service Use by Group

Reference	Comparison	<i>p</i>	Cohen's <i>d</i>
Control (<i>M</i> = .34; <i>SD</i> = .33)	Dxd Control	0.680	0.083
	Pure ADHD	0.674	-0.120
	ADHD + Mood	0.027	-0.458
	ADHD + Anxiety	0.075	-0.576
	ADHD + Other	0.006	-0.818
	ADHD + Multiple	0.670	-0.111
Dxd Control (<i>M</i> = .31; <i>SD</i> = .32)	Pure ADHD	0.515	-0.199
	ADHD + Mood	0.041	-0.538
	ADHD + Anxiety	0.070	-0.668
	ADHD + Other	0.009	-0.915
	ADHD + Multiple	0.513	-0.191
Pure ADHD (<i>M</i> = .39; <i>SD</i> = .38)	ADHD + Mood	0.074	-0.318
	ADHD + Anxiety	0.130	-0.424
	ADHD + Other	0.012	-0.654
	ADHD + Multiple	0.983	0.009
ADHD + Mood (<i>M</i> = .51; <i>SD</i> = .39)	ADHD + Anxiety	0.753	-0.09
	ADHD + Other	0.278	-0.317
	ADHD + Multiple	0.093	0.328
ADHD + Anxiety (<i>M</i> = .54; <i>SD</i> = .35)	ADHD + Other	0.557	-0.239
	ADHD + Multiple	0.130	0.435
ADHD + Other (<i>M</i> = .63; <i>SD</i> = .36)	ADHD + Multiple (<i>M</i> = .38; <i>SD</i> = .37)	0.016	0.665

Note: Dxd Control = control with a non-ADHD clinical diagnosis;

ADHD + Mood = diagnosis of ADHD and at least one mood disorder; ADHD + Anxiety = diagnosis of ADHD and at least one anxiety disorder; ADHD + Other = diagnosis of ADHD and one other disorder; ADHD + Multiple = diagnosis of ADHD and two or more disorders.

Table 17

Means and Standard Deviations for Variables Predicting Service Use

<u>Variable</u>	<u>Mean (SD)</u>
Total Service Use	3.55 (3.33)
Gender (% Female)	52.0% (.50)
Ethnicity (% Non-Hispanic)	91.0% (0.29)
Race (% White)	71.28% (0.45)
Group % ADHD	49% (0.50)
Symptom Severity	19.21 (13.67)
Parent Ed	5.02 (1.46)
Parent Job	75.87 (22.83)
Pre-College Service Use %	38% (0.49)
1 st Year GPA	3.02 (0.78)
FSIQ Score	110.40 (12.23)
Diagnoses	0.63 (0.93)

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; Sym. Severity = ADHD symptom severity; score = WASI full scale IQ score; Diagnoses = number of non-ADHD psychiatric conditions

Table 18
Intercorrelations of Multiple Regression Variables Predicting First Year Service Use

Service Use											
Gender	-.042										
Ethnicity	.043	.076									
Race	.092*	-.005	.297***								
Par. Ed	.001	.089*	-.161**	-.234***							
Par. Job	-.001	-.018	-.080	-.137**	.497***						
Sym. Severity	.127**	-.075	.014	-.100*	.051	.040					
Pre Col. Use	.250***	-.075	-.071	-.178***	.138**	.103*	.370***				
GPA	-.013	-.128**	.018	-.096*	.146**	.086*	-.221***	-.118*			
FSIQ Score	-.034	.068	-.017	-.189***	.257***	.225***	.017	.028	.186***		
Group	-.154**	.020	-.005	.109*	-.133**	-.106**	-.858***	-.442***	.206***	-.039	
Diagnoses	.059	-.266***	-.051	-.086*	-.078	-.051	.456***	.257***	-.146**	-.028	-.423***

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; Sym. Severity = ADHD symptom severity; Pre Col. Use = pre-college service use; FSIQ score = WASI full scale IQ score; Diagnoses = number of non-ADHD psychiatric conditions.

Table 19

Regression Statistics for Full and Final Models Predicting Service Use

Model	Variable	<i>R</i> / <i>B</i>	<i>R</i> ² / β	<i>SE</i>	<i>P</i> -Value	ANOVA <i>F</i>	Model <i>P</i>
Full		.297	.088	3.23	<.001	3.336	<.001
	Gender	-.144	-.022	.353	.682		
	Ethnicity	.205	.018	.595	.730		
	Race	.994	.135	.398	.013		
	Parent Ed	-.010	-.005	.137	.939		
	Parent Job	-.002	-.014	.008	.810		
	Symptom Severity	.000	.002	.024	.987		
	Pre Col. Serv. Use	1.746	.254	.384	.000		
	Cumulative GPA	.199	.045	.234	.396		
	FSIQ Score	-.006	-.022	.014	.675		
	Group	-.523	-.079	.674	.438		
	Diagnoses	-.102	-.028	.211	.628		
Final		.286	.082	3.20	.278	17.264	<.001
	Race	1.037	.141	.364	.005		
	Pre Col. Serv. Use	1.893	.275	.340	<.001		

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; Sym. Severity = ADHD symptom severity; Pre Col. Serv. Use = pre-college service use; FSIQ score = WASI full scale IQ score; Diagnoses = number of non-ADHD psychiatric conditions; Pre Col. Serv. Use = pre college service use

Table 20

Means and Standard Deviations for Variables Predicting GPA

<u>Variable</u>	<u>Mean (SD)</u>
Fall GPA	3.10 (.75)
Spring GPA	2.98 (.84)
Group (% ADHD)	45% (.50)
Gender (% Male)	50% (.50)
Ethnicity (% Non-Hispanic)	90% (.30)
Race (% White)	73.64% (.44)
Parent Ed	5.14 (1.35)
Parent Job	77.14 (21.84)
HS GPA	3.65 (.51)
FSIQ Score	111.50 (12.05)
Word Reading	109.90 (6.10)
Numerical Operations	111.74 (14.38)
Essay Composition	115.29 (10.77)
SAT Total	1184.68 (182.38)
Total Service Use	3.21 (3.05)

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; HS GPA = high school GPA; FSIQ score = WASI full scale IQ score; Word Reading = WIAT word reading standard score; Numerical Operations = WIAT numerical operations standard score; Essay Composition = WIAT numerical operations standard score; SAT Total = SAT total score; Total Service Use = pre-college service use

Table 21

Intercorrelations of Multiple Regression Variables Predicting First Semester GPA

Variable	Group	Gender	Ethnicity	Race	Parent Ed	Parent Job	HS GPA	FSIQ Score	Word Read.	Num. Oper.	Essay Comp.	SAT Total	Tot. Serv. Use
Fall GPA	.229***												
Group		-.173**	-.099										
Gender			.127*										
Ethnicity				.351***									
Race					-.124*	-.130*							
Parent Ed						.477***							
Parent Job							.013						
HS GPA								.222***					
FSIQ Score									.298***				
Word Read.										.241***			
Num. Oper.											.107		
Essay Comp.												.089	
SAT Total													.008
Tot. Serv. Use													

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; Parent Ed = highest parent educational level; Parent Job = highest parent occupational

prestige score; HS GPA = high school GPA; FSIQ score = WASI full scale IQ score; Word Read. = WIAT word reading standard

score; Num. Oper. = WIAT numerical operations standard score; Essay Comp. = WIAT numerical operations standard score; SAT

Total = SAT total score; Tot. Serv. Use = pre-college service use

Table 22
Regression Statistics for the Model Predicting First Semester GPA

Model	Variable	R/B	R^2/β	SE	p -Value	ANOVA F	Model p
1		.342	.177	.710	<.001	4.706	<.001
	Group	.404	.271	.100	<.001		
	Gender	-.244	-.164	.098	.013		
	Ethnicity	-.009	-.004	.172	.957		
	Race	-.062	-.036	.117	.601		
	Parent Ed	.118	.213	.043	.006		
	Parent Job	-.001	-.021	.003	.774		
2		.583	.340	.623	<.001	8.870	<.001
	Group	.116	.078	.096	.228		
	Gender	-.206	-.139	.087	.019		
	Ethnicity	.045	.018	.155	.774		
	Race	-.006	-.003	.107	.959		
	Parent Ed	.055	.099	.039	.161		
	Parent Job	-.001	-.042	.002	.522		
	HS GPA	.484	.332	.099	<.001		
	IQ Score	.003	.052	.004	.448		
	Word Read.	.003	.022	.008	.733		
	Num. Oper.	.003	.058	.004	.453		
	Essay Comp.	.011	.156	.004	.009		
	SAT Total	.001	.132	.000	.151		
3		.583	.340	.298	.751	8.160	<.001
	Group	.112	.075	.097	.247		
	Gender	-.210	-.141	.088	.018		
	Ethnicity	.046	.019	.155	.767		
	Race	-.001	.000	.109	.996		
	Parent Ed	.055	.100	.039	.161		
	Parent Job	-.001	-.042	.002	.523		
	HS GPA	.484	.332	.099	<.000		
	FSIQ Score	.003	.052	.004	.448		
	Word Read.	.003	.021	.008	.744		
	Num. Oper.	.003	.056	.004	.465		
	Essay Comp.	.011	.154	.004	.010		
	SAT Total	.001	.134	.000	.147		
	Tot. Serv. Use	-.005	-.019	.014	.751		

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational

prestige score; HS GPA = high school GPA; FSIQ score = WASI full scale IQ score; Word

Read. = WIAT word reading standard score; Num. Oper. = WIAT numerical operations standard

score; Essay Comp. = WIAT numerical operations standard score; SAT Total = SAT total score;

Tot. Serv. Use = pre-college service use

Table 23
Intercorrelations of Multiple Regression Variables Predicting Second Semester GPA

Fall GPA													
Group	.200**												
Gender	-.261***	-.096											
Ethnicity	-.110	.026	.123*										
Race	-.078	.094	.096	.356***									
Parent Ed	.028	-.268***	.079	-.126*	-.109								
Parent Job	.042	-.120*	-.022	-.041	.022	.474***							
HS GPA	.365***	.351***	-.162**	-.072	-.005	.018	.038						
FSIQ Score	.133*	.012	-.017	-.046	-.072	.212**	.163**	.216**					
Word Read.	.054	.020	.090	-.051	-.281***	.142*	-.014	.176**	.290***				
Num. Oper.	.171**	.111	.025	.065	-.009	.247***	.210**	.295***	.364***	.228***			
Essay Comp.	.183**	.164**	.022	-.029	-.083	-.026	-.029	.232***	-.028	.153**	.114*		
SAT Total	.193**	.021	.026	-.140*	-.123*	.378***	.271***	.363***	.549***	.366***	.645***	.091	
Serv. Use	-.024	-.121*	-.116*	.054	.150*	.038	.055	-.019	.019	-.103	-.031	-.127*	.013

Note: * = $p < .05$; ** = $p < .01$; *** = $p < .001$; Parent Ed = highest parent educational level; Parent Job = highest parent occupational

prestige score; HS GPA = high school GPA; FSIQ score = WASI full scale IQ score; Word Read. = WIAT word reading standard

score; Num. Oper. = WIAT numerical operations standard score; Essay Comp. = WIAT numerical operations standard score; SAT

Total = SAT total score; Serv. Use = pre-college service use

Table 24
Regression Statistics for the Model Predicting Second Semester GPA

Model	Variable	R/B	R^2/β	SE	p -Value	ANOVA F	Model p
1		.341	.116	.802	<.001	4.643	<.001
	Group	.349	.207	.114	.002		
	Gender	-.395	-.235	.111	.000		
	Ethnicity	-.165	-.059	.195	.397		
	Race	-.088	-.046	.134	.513		
	Parent Ed	.049	.079	.048	.304		
	Parent Job	.001	.023	.003	.755		
2		.455	.207	.771	.001	4.494	<.001
	Group	.139	.082	.119	.242		
	Gender	-.346	-.206	.109	.002		
	Ethnicity	-.130	-.046	.192	.501		
	Race	-.077	-.040	.135	.567		
	Parent Ed	.016	.026	.048	.741		
	Parent Job	<.001	.000	.003	.997		
	HS GPA	.402	.243	.123	.001		
	FSIQ Score	.003	.043	.005	.572		
	Word Read.	-.006	-.044	.010	.541		
	Num. Oper.	.003	.048	.005	.567		
	Essay Comp.	.009	.112	.005	.087		
	SAT Total	.000	.038	.000	.703		
3		.456	.208	.772	.795	4.135	<.001
	Group	.135	.080	.120	.260		
	Gender	-.350	-.209	.110	.002		
	Ethnicity	-.128	-.046	.193	.508		
	Race	-.072	-.038	.136	.597		
	Parent Ed	.016	.026	.048	.739		
	Parent Job	<.001	.000	.003	.995		
	HS GPA	.403	.243	.123	.001		
	FSIQ Score	.003	.043	.005	.572		
	Word Read.	-.006	-.045	.010	.534		
	Num. Oper.	.003	.047	.005	.577		
	Essay Comp.	.009	.111	.005	.093		
	SAT Total	.000	.040	.000	.693		
	Tot. Serv. Use	-.005	-.017	.018	.795		

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational

prestige score; HS GPA = high school GPA; FSIQ score = WASI full scale IQ score; Word

Read. = WIAT word reading standard score; Num. Oper. = WIAT numerical operations standard

score; Essay Comp. = WIAT numerical operations standard score; SAT Total = SAT total score;

Serv. Use = pre-college service use

Matthew J. Gormley, M. Ed.

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EDUCATION

Lehigh University September, 2016 *Anticipated*

Doctor of Philosophy, School Psychology

Dissertation: First Year GPA and Academic Service Use Among College Students With and Without ADHD. Defended: 5/12/15

Committee Members: George J. DuPaul, Ph.D., Arthur D. Anastopoulos, Ph.D., Robin L. Hojniski, Ph.D., & Bridget V. Dever, Ph.D.

Lehigh University January, 2011

Master of Education, Human Development

Qualifying Project: Teacher-to-Teacher Consultation: Facilitating Grade-Level Transitions of Students with ADHD.

Committee Members: George J. DuPaul, Ph.D., Christine Cole, Ph.D., & Patricia Manz, Ph.D.

State University of New York College at Geneseo May 2008

Bachelor of Arts, Psychology, Summa Cum Laude

PROFESSIONAL CERTIFICATIONS

Certified School Psychologist in Pennsylvania October, 2014

PROFESSIONAL AFFILIATIONS

Association for Behavioral and Cognitive Therapies, Student Member 2014 - Present

American Psychological Association, Division 53, Student Affiliate 2013 - Present

American Psychological Association, Division 54, Student Affiliate 2013 - Present

American Psychological Association, Division 16, Student Affiliate 2012 - Present

American Psychological Association, Student Affiliate 2012 - Present

National Association of School Psychologists, Student Affiliate 2011 - Present

AWARDS & HONORS

School Psychology Representative at the Lehigh University Academic Symposium April, 2013

Forum Research Grant for "Teacher-to-Teacher Consultation: Facilitating Grade-Level Transitions of Students with ADHD" October, 2012

Leiser Scholar (Special Education Law Conference) May, 2011

RESEARCH AND WORK EXPERIENCE

Project Coordinator – Lehigh University, Bethlehem, PA

Response to Intervention Training Project

September 2014 - Present

Dr. Edward Shapiro, Professor of School Psychology

- Assisted with the selection of project trainees.
- Served as a liaison with project sites and facilitate the practicum experiences of trainees.
- Reviewed project progress to ensure students meet required expectations.
- Provided supervision for trainees during their internship placements.

Project Coordinator – Lehigh University, Bethlehem, PA March 2012 - Present
Trajectories Related to ADHD in College (TRAC)

Dr. George J. DuPaul, Professor of School Psychology

- Met with Disability Service Coordinators at Lehigh Valley colleges to coordinate participant recruitment.
- Coordinated a team of six graduate students.
- Conducted diagnostic evaluations including multi-informant rating scales and semi-structured diagnostic interviews.
- Trained graduate students on diagnostic evaluation procedures.
- Collected, maintained, and analyzed data.

Graduate Assistant – Lehigh University, Bethlehem, PA August 2010 – Present

Dr. George J. DuPaul, Professor of School Psychology

- Assisted Dr. DuPaul in the completion of manuscripts and grant applications.
- Collected, maintained and analyzed data.
- Conceptualized, executed and co-authored multiple manuscripts.

Project Coordinator – Center for Children and Families, Buffalo, NY August 2009 – July 2010
Classroom Strategies Scale - Observer Form

Dr. Gregory A. Fabiano, Assistant Professor, SUNY at Buffalo

- Coordinated and conducted presentations for principals and teachers describing the project and relevant information.
- Formally consented individuals into the study.
- Coordinated project with Rutgers University site.
- Scheduled observations of teachers with principals and conducted observations.
- Trained undergraduate observers.
- Organized mailings for recruitment.
- Collected and managed data.

Sr. Research Support Specialist – July 2008 - July 2010
Center for Children and Families, Buffalo, NY

Dr. Gregory Fabiano, Assistant Professor, SUNY at Buffalo

- Conducted comprehensive intake procedures: DPICS coding system for parent-child interactions, an IQ screening using WISC-IV (vocabulary and block design subtests) and a WIAT-II screening.
- Implemented evidenced based, manualized treatment to children with ADHD, some with co-morbid ODD in an innovative sports based treatment.
- Organized, trained, and led a team of paraprofessionals in the

implementation of individualized contingency management (i.e., daily report cards) for a group of eight children during structured activities while parents received parent training.

- Coordinated and implemented a week-long experiential learning training for approximately 45 Head Start teachers and 32 pre-K students with key study personnel.
- Taught a class of 12 preschool students during a week-long teacher training.
- Conducted classroom observations using the Classroom Assessment Scoring System (CLASS).
- Used motivational interviewing techniques with adolescent participants.
- Conducted weekly one-on-one individualized psychoeducation sessions with adolescents regarding driving and interactions with their parents.
- Supported a weekly contracting session between parents and adolescents.
- Collected, maintained, and analyzed data.

PROFESSIONAL SERVICE

Student Editor: Assessment for Effective Intervention

2014

ADHD and the Struggling Learner. Palisades School District professional development workshop. Kintnersville, PA (February, 2013).

SUPERVISED PRACTICA EXPERIENCE

**Psychology Trainee, Pediatric Pulmonary, Cystic Fibrosis,
and Sleep Disorders Center**

August 2012 - June 2014

Pediatric Specialty Center at Lehigh Valley Hospital, Allentown, PA

Supervisor: Patricia Manz, Ph.D.

- Participated as a member of multidisciplinary team to provide comprehensive.
- Consulted with patients with cystic fibrosis, asthma, sleep disorders, and other pulmonary needs and their families on academic, behavioral, emotional, and health-related concerns.
- Assisted families in navigating individualized education plans (IEPs) and 504 service plans and increasing hospital-school communication about medication health, and treatment needs.
- Assisted families with behavior difficulties at home and school through parent behavior management training.
- Implemented and evaluated treatment adherence interventions. Provided individual counseling for emotional difficulties, such as self-esteem, anxiety, depression, and bullying.
- Facilitated school re-integration for children with prolonged and intermittent school absenteeism. Educated health care professionals regarding the impact of chronic health conditions on children's educational and mental health functioning.

Psychology Trainee, Bethlehem Area School District

Sept 2013 - June 2014

Supervisor: Lidia Cordero, MSW, M.Ed, Eds.

- Conducted comprehensive multidisciplinary psychoeducational evaluations to determine special education eligibility for elementary and middle school students.
- Evaluated children with pediatric health conditions, psychiatric conditions, and cognitive and developmental disabilities.
- Consulted with teachers and parents to develop and implement classroom- and home-based interventions to improve students' behavior and academic performance.
- Conducted evaluations to determine Chapter 16 giftedness eligibility.
- Developed teacher rating form to help identify students for gifted education.

Psychology Trainee, East Penn School District

Sept 2012 – June 2013

Supervisor: Noelle Gecik, M.Ed

- Conducted comprehensive multidisciplinary psychoeducational evaluations to determine special education eligibility for elementary and middle school students.
- Evaluated children with pediatric health conditions, psychiatric conditions, and cognitive and developmental disabilities.
- Consulted with teachers and parents to develop and implement classroom- and home-based interventions to improve students' behavior and academic performance.
- Conducted evaluations to determine Chapter 16 giftedness eligibility.

SUPERVISION EXPERIENCE

Project Coordinator – Response to Intervention Training Project

Sept 2014 - Present

Lehigh University, Bethlehem, PA

- Provide competency-based supervision of students engaged in practicum placements in middle and high school settings.
- Meet with students to ensure adequate progress and problem-solve difficulties.

Supervision Seminar and Practicum

Jan 2014 - May

2014

Lehigh University, Bethlehem, PA

Instructor/Supervisor: Christy Novak, Ph.D.

- Provided direct instruction on the practical, theoretical, and legal issues surrounding supervision.
- Gained direct experience developing and conducting group supervision of 3rd year school psychology doctoral student's practicum activities.
- Grounded in a competency-based, scientist-practitioner model.

SPECIALIZED COURSEWORK

Introduction to Structural Equation Modeling and Longitudinal 2012

Aug 2012 - Dec

Data Analysis

Lehigh University, Bethlehem, PA

Instructor: Grace Caskie, Ph.D.

- Provided instruction in the principles and application of structural equation modeling (SEM).
- Focused on theoretical and applied exercises using AMOS software including an independent demonstration of SEM proficiency.
- Factorial invariance analysis was conducted to examine the invariance of retrospective report of ADHD symptomology in a national survey.

Applications of Pediatric School Psychology - 2014

Jan 2013 - May

Prevention & Health Promotion

Lehigh University, Bethlehem, PA / Children's Hospital of Philadelphia

Instructor: Thomas Power, Ph.D.

- Provided instruction in public health models of prevention and health promotion for children at-risk for disabilities as well as those who are healthy.
- Specific emphasis was placed on addressing the needs of children from low income, urban, and ethnically diverse neighborhoods.
- Developed skills in program development, program evaluation, and provided systematic instruction in grant writing.
- An early career development grant proposal was written to develop and implement a mental health promotion program for children at risk for ADHD.

Comprehensive School Health Programs 2013

Aug 2013 - Dec

Lehigh University, Bethlehem, PA

Instructor: Edward Shapiro, Ph.D.

- Examined evidence-based programs and methods of health promotion and prevention of health-related problems.
- Focused on issues of risk and resilience related to the prevention of health-related problems.
- Emphasized the development of needs and effective methods of implementing health promotion and prevention programs in low-income, urban, and racially/ethnic diverse populations.

Hierarchical Linear Modeling (Audited) 2014

Aug 2014 - Dec

Lehigh University, Bethlehem, PA

Instructor: Bridget Dever, Ph.D.

- Provided instruction in the principles and application of hierarchical linear modeling (HLM).
- Focused on theoretical and applied exercises using HLM software.
- Required independent demonstration of proficiency using existing data.

RELATED EXPERIENCE

Counselor, Summer Treatment Program for Children with ADHD

Summer 2008

Department of Psychology, University at Buffalo

Dr. William Pelham, Director

- Implemented an evidenced-based, manualized behavior modification program for 15 children with ADHD, some with comorbid ODD and CD, in a summer camp setting.
- Designed and led baseball skill drills and games.
- Responsible for tracking the behavior of three students as well as modifying their daily behavioral targets as reflected on their daily report card.
- Responsible for driving four students to and from the treatment program.

PUBLICATIONS IN REFEREED JOURNALS

Gormley, M. J., Pinho, T., Pollack, B., Puzino, K., Franklin, M., DuPaul, G. J., Anastopoulos, A. D., & Weyandt, L. L. (in press). Impact of study skills and parent education on first-year GPA among college students with and without ADHD: A moderated mediation model. *Journal of Attention Disorders*.

Gormley, M. J., & DuPaul, G. J. (2014). Teacher to teacher consultation: Facilitating consistent and effective intervention across grade levels for students with ADHD. *Psychology in the Schools*. Advance online publication. doi: 10.1002/pits.21803

Suldo, M. S., **Gormley, M. J.,** DuPaul, G. J., & Anderson-Butcher, D. (2014). The Impact of School Mental Health on Student and School-Level Academic Outcomes: Current Status of the Research and Future Directions. *School Mental Health, 6,* 84-98. doi: 10.1007/s12310-013-9116-2

Vujnovic, R.K., Fabiano, G.A., Pelham, W.E., Greiner, A., Waschbusch, D.A., Gera, S., Linke, S., **Gormley, M.,** & Buck, M. (2014). The Student Behavior Teacher Response (SBTR) System: Preliminary psychometric properties of an observation system to assess teachers' use of effective behavior management strategies in preschool classrooms. *Education and Treatment of Children, 37,* 323-346. DOI: 10.1353/etc.2014.0020

DuPaul, G. J., **Gormley, M. J.,** & Laracy, S. D. (2013). Comorbidity of LD and ADHD: Implications of *DSM-5* for Assessment and Treatment. *Journal of Learning Disabilities, 46,* 43-51. DOI: 10.1177/0022219412464351

DuPaul, G. J., Kern, L., **Gormley, M. J.,** & Volpe, R. J. (2011). Early intervention for young children with ADHD: Academic outcomes for responders to behavioral treatment. *School Mental Health, 3,* 117-126. DOI: 10.1007/s12310-011-9053-x

Fabiano, G.A., Hulme, K., Linke, S.M., Nelson-Tuttle, C., Pariseau, M.E., Gangloff, B., Lewis, K., Pelham, W.E., Waschbusch, D.A., Waxmonsky, J., **Gormley, M.,** Gera, S., & Buck, M.M. (2011). The Supporting A Teen's Effective Entry to the Roadway (STEER) Program: Feasibility and Preliminary Support for a Psychosocial Intervention for

Teenage Drivers with ADHD. *Cognitive and Behavioral Practice*, 18, 267-280.

Fabiano, G.A., Pelham, W.E., Cunningham, C.E., Yu, J., Gangloff, B., Buck, M., Linke, S.M., **Gormley, M.**, & Gera, S. (2012). A Waitlist-Controlled Trial of Behavioral Parent Training For Fathers of Children with Attention-Deficit/Hyperactivity Disorder. *Journal of Clinical Child and Adolescent Psychology*.

BOOK CHAPTERS

- DuPaul, G. J., **Gormley, M. J.**, & Laracy, S. D. (2014). School-Based Interventions for Elementary School Students with ADHD. In S. Faraone & K. M. Antshel (Eds.) *Child and adolescent psychiatric clinics of North America*. Philadelphia: W.B. Saunders.
- DuPaul, G. J., Laracy, S. D., & **Gormley, M. J.** (2013). Interventions for students with attention- deficit/hyperactivity disorder: School and home contexts. In H. Walker & F. Gresham (Eds.) *Handbook of Evidence-Base Practices for Emotional and Behavioral Disorders*. New York: Guilford.
- DuPaul, G. J., Carson, K. M., **Gormley, M. J.**, Vile Junod, R., Flammer-Rivera, L. (2012). Attention deficit hyperactiviyy disorder: School-based cognitive-behavioral interventions. In R. B. Mennuti, R. W. Christner, & A. Freeman (Eds). *Cognitive-behavioral interventions in educational settings: A handbook for practice* (2nd ed). (pp. 405-440). New York, NY: Routledge.

NON-PEER-REVIEWED ARTICLES

Gormley, M. J., & DuPaul, G. J. (2015). Teacher-to-teacher consultation: Facilitating consistent school support across grade levels. *The ADHD Report*, 23(2), 9-11, 16.

PROFESSIONAL PRESENTATIONS

Gormley, M. J., Pinho, T., Pollack, B., Laracy, S. D., Busch, C., Franklin, M., Puzino, K., Hollingsworth, K., & DuPaul, G. J. (2014, August; Accepted). First-year GPA for college students with and without ADHD: A moderated mediation model. In A. D. Anastopoulos (Chair), Longitudinal outcome of college students with ADHD: Initial findings from two studies. Symposium presented at the annual convention of the American Psychological Association, Washington, D.C.

POSTER PRESENTATIONS

- Pollack, B., **Gormley, M. J.**, Pinho, T., DuPaul, G. J., Oster, D. R., Weyandt, L., Anastopoulos, A. D. (2015, February). Service utilization among college students with ADHD and learning disabilities. Poster presented at the annual conference of the National Association of School Psychologists, Orlando, FL.
- DuPaul, G. J., Laracy, S. D., **Gormley, M. J.**, Pinho, T. D., Pollack, B. L. (2014, August). Adolescents with ADHD transitioning to college: Self-concept and school preparation. Poster presented at the annual convention of the American Psychological Association, Washington, D.C.
- Gormley, M. J.**, DuPaul, G. J. (2013, February). Teacher-to-teacher consultation: Facilitating The grade-level transition of students with ADHD. Poster presented at the annual conference of the National Association of School Psychologists, Seattle, WA.
- Gormley, M. J.**, DuPaul, G. J. (2013, April). Teacher-to-teacher consultation: Facilitating the

grade-level transition of students with ADHD. Selected poster presented at the 2013 Academic Symposium at Lehigh University.

MANUSCRIPTS IN SUBMITTED FOR PUBLICATION

- DuPaul, G. J., Pinho, T., Pollack, B., **Gormley, M. J.**, & Laracy, S. D. (2015). First-Year College Students with ADHD and/or LD: Differences in Self-Concept, School Preparation, and College Expectations. Manuscript submitted for publication.
- Anastopoulos, A. D., DuPaul, G. J., Weyandt, L. L., Morrissey-Kane, E., Sommer, J. L., Rhoads, L. H., Murphy, K. R., **Gormley, M. G.**, & Gudmundsdottir, B. G. (2015). Rates and patterns of Comorbidity among first-year college students with ADHD. Manuscript submitted for publication.

MANUSCRIPTS IN PREPERATION

- DuPaul, G. J., Fu, Q., **Gormley, M. J.**, Laracy, S. D., Pollack, B., Pinho, T., Dahlstrom-Hakki, I., Hecker, L., Banerjee, M. (2014). Impact of academic coaching and support on GPA among students with ADHD and LD. Manuscript in preparation.
- DuPaul, G. J., Hyman, S., **Gormley, M. J.** (2014). Evidence-Based Assessment and Intervention of ADHD in School Psychology. In M. Thielking & M. Terjeseen (Eds.) *Handbook of Australian School Psychology: Bridging the Gaps in International Research, Practice, and Policy*. Manuscript in preparation.

OTHER CURRENT RESEARCH ACTIVITIES

ADHD RS-5 Reliability and Validity Study Sep 2014 - Present
Co-Pi's: Dr. George DuPaul, Dr. Thomas Power, Dr. Arthur Anastopoulos, & Dr. Robert Reid.

- Trained graduate student on the Behavioral Observation of Students in Schools (BOSS) observation system.
- Conducted 60 observations of students using the BOSS to provide an observational measure of criterion-related validity.
- Administered ADHD RS-5 and Conners 3 rating scale to the parents and teachers of 30 general education students in grades K-12.
- Will assist in the analysis and dissemination of results.

BOSS-EE Generalizability Study Jul 2014 - Present
Co-Pi's: Dr. Robin Hojnoski & Dr. Brenna Wood.

- Coded video tapes of preschool children using the Behavioral Observation of Students in Schools – Early Education observation system.
- Will assist in the Generalizability Theory analyses using the GENOVA family of software.

Impact of Parent School Experiences on Parent Training Attendance and Acceptability May 2013 – Present

Co-Pi's: Dr. George DuPaul, & Dr. Lee Kern.

- Created a pilot measure of parental disability status, special educational services, and educational experiences.
- Will conduct basic psychometric tests on the measure. If psychometric properties are adequate, will use as a predictor of parent attendance at and satisfaction with a new parent training program.