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Matthew J. Gormley

George J. DuPaul

Lisa L. Weyandt

Arthur D. Anastopoulos

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

Matthew J. Gormley[1], **George J. DuPaul**[1], **Lisa L. Weyandt**[2], **Arthur D. Anastopoulos**[3]

[1]Lehigh University, Bethlehem, PA, USA

[2]University of Rhode Island, Kingston, RI, USA

[3]University of North Carolina at Greensboro, NC, USA

Abstract

Objective: ADHD is a chronic neurodevelopmental disorder that typically results in persistent academic difficulties over time. Although most colleges offer support services, students often do not use the available services or those to which they are entitled. The present study examined predictors of academic performance among college students with and without ADHD. In addition, the rate, predictors, and outcomes of academic service use were explored.

Methods: A series of multivariate analyses of variance (MANOVAs) and regression analyses were conducted using SPSS v. 21 ® software.

Results: First year college students with ADHD earned significantly lower grade point averages (GPAs) relative to students without ADHD. Additionally, ADHD combined with other disorders, but not ADHD alone, predicted higher rates of service use relative to students without ADHD. Finally, the findings suggest that typically available academic services are not independently related to GPA among first-year college students with or without ADHD.

Conclusion: This study replicates previous work demonstrating significantly lower GPAs among a rigorously defined sample of students with ADHD relative to students without ADHD. Second, this study indicates that traditional predictors of college success may be less meaningful for students with ADHD relative to those without ADHD. Finally, additional research needs to be conducted regarding the use and effectiveness of academic services on college campuses. (*J. of Att. Dis. XXXX; XX(X) XX-XX*)

Keywords

ADHD; academic performance; service use; college students

Across the life span, ADHD has been associated with behavioral, social, vocational, and academic difficulties (American Psychiatric Association [APA], 2013; Barkley, 2015; Barkley, Murphy, & Fischer, 2008). With regard to secondary education, students with

Corresponding Author: Matthew J. Gormley, Lehigh University, 111 Research Drive, Iacocca Hall, Bethlehem, PA 18015, USA., jg510@lehigh.edu.

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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). Furthermore, secondary school students with ADHD are more likely to be retained, suspended or expelled relative to nonaffected peers and are 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 et al., 2008; Kent et al., 2011). The extant research literature indicates that individuals with ADHD (29.5%) enroll in 4-year postsecondary education significantly less often relative to students without ADHD (76.8%; Kuriyan et al., 2013). Nevertheless, recent data indicate that 5.9% of incoming first-year students report a diagnosis of ADHD suggesting that individuals diagnosed with ADHD represent a potentially meaningful minority of first-year college students (Eagan et al., 2014).

Although individuals with ADHD who attend college can be considered a high-functioning subset of the ADHD population, high self-ratings of ADHD symptomology or a self-reported diagnosis of ADHD has been correlated with lower GPAs, more academic difficulties, fewer effective study skills, and greater levels of psychiatric diagnoses (Advokat, Lane, & Lou, 2011; Anastopoulos & King, 2015; see Weyandt & DuPaul, 2013, for a review). Although these data collectively indicate students with ADHD experience significant difficulties in college, to date, this has not been investigated with a rigorously defined sample of students meeting diagnostic criteria for ADHD. Furthermore, the impact of comorbid conditions on the academic outcomes has not been evaluated with this population.

The intervention literature for college students with ADHD is limited but growing. Empirical evaluations of common accommodations for college students with ADHD (e.g., extended time, strategic seating) have indicated these strategies are either ineffective or equivocal (Clifton, 2007; Lovett & Leja, 2015; Miller, Lewandowski, & Antshel, 2013; Wadley & Liljequist, 2013). A recent investigation of an intensive 8-week coaching intervention for students with ADHD indicated modest but statistically significant improvements in study and learning strategies, self-esteem, symptom distress, and satisfaction with school and work (Prevatt & Yelland, 2015). Similarly, initial investigations of cognitivebehavioral therapy (CBT) for college students with ADHD are emerging with positive results in pilot studies (Anastopoulos & King, 2015; LaCount, Hartung, Shelton, Clapp, & Clapp, 2015). Scheithauer and Kelley (2014) reported statistically significant reductions in self-reported ADHD symptomology and higher levels of academic goal attainment among college students with ADHD who had received study skill and self-monitoring instruction relative to a group who received study skill instruction alone. Although promising, such interventions are not yet widely available to college students.

More generally, colleges have begun to increase academic and disability support services for first-year students given the relationship between first-semester and first-year GPA and retention (Allen, 1999; Murtaugh, Burns, & Schuster, 1999) and the disproportionate level of attrition prior to the second year of college (Newman et al., 2011). Unfortunately, the extant literature suggests the availability and quality of support services is questionable with only 40% of students reporting their university offered appropriate accommodations, and among

those students, only 45% of students reported actually using services (Chew, Jensen, & Rosén, 2009).

Despite this growing literature base, there exist several significant gaps in our understanding of ADHD among college students. First, although previous research has found differences in GPA between students with and without ADHD, these findings are limited by small sample size, nonrigorous evaluation of ADHD and its comorbid features, or limited generalizability due to samples being drawn from a single college campus. In addition, it is possible that individuals with ADHD who attend college have similar GPAs to other students attending college. Second, research has not identified predictors of academic performance among college students with ADHD, information needed to appropriately target and tailor interventions. 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 whether service use is related to improved academic outcomes among students with and without ADHD during their first-year at a 4-year college.

The present study addressed the following research questions pertaining to GPA and service utilization. Regarding GPA,

Research Question 1:

Using a relatively large, rigorously defined sample, can the significant differences between the GPAs of students with and without ADHD be replicated at both the high school (i.e., final GPA) and college levels (i.e., spring and fall of first year)?

Based on previous research, it was predicted that students with ADHD would have significantly lower GPAs relative to those without ADHD across all three time points.

Research Question 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?

It was hypothesized that traditional predictors of academic performance would be less predictive for students with ADHD.

With respect to service utilization,

Research Question 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?

Based on the results of Chew and colleagues (2009), it was anticipated that at least 45% of students with any disability would report using support services, with no significant

differences between students with ADHD and those with another disability and both groups demonstrating higher service use relative to those with no disability.

Research Question 4:

What variables including demographic characteristics (e.g., gender, race, ethnicity), symptom severity, GPA, or past service use predict service use in college?

No specific hypothesis for this question was made given its exploratory nature.

Research Question 5:

Does self-reported use of academic and/or disability services predict improved academic outcomes?

It was hypothesized that use of support services would be associated with improved academic outcomes.

Method

Participants

Participants for the present study are a subsample from the Trajectories Related to ADHD in College (TRAC) project, a larger multisite 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 con-236 females (51.8%) and was mostly non-Hispanic Caucasian (67.5%). With respect to self-reported ethnicity, 10.3% of participants identified themselves as Hispanic or Latino. The majority of students identified as Caucasian (71.7%), followed by African American (12.3%), Other (6.6%), Asian (5.3%), and more than one race (3.9%). Eligibility criteria for the ADHD group were based on a multigated screening method. In the first phase of screening, either students or their parents had to endorse at least four symptoms of ADHD during childhood and during the last 6 months. During the second phase, all students were required to meet full *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*) diagnostic criteria (APA, 2013) for ADHD on a semistructured interview.

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 (Phase 1). Similarly, participants could endorse no more than three symptoms of ADHD on the semistructured interview (Phase 2). 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, socioeconomic status, and racial or ethnic diversity.

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 because data collection occurred across three sessions due to the length of the assessment (2–3 hr). Not all data were collected during a single session, and some participants failed to return for subsequent meetings therefore resulting in missing data. Similarly, GPA data were not available for all students. Sample sizes for each analysis are listed in Table 1.

For each analysis, 10 chi-square or independent sample *t* tests were conducted to determine whether there were significant differences between included and excluded cases on key demographic variables (i.e., ADHD status, age, gender, race, ethnicity, full scale IQ, parent education, parent occupation, total comorbid diagnoses, total ADHD severity). Included and excluded cases did not differ on any variable for Research Question 1. For the second and fifth research questions, excluded cases were more likely to have ADHD ($\chi^2 = 4.25$, $p = .024$), have higher total ADHD severity, $t(449) = 2.40$, $p = .017$, and have more comorbid diagnoses, $t(446.37) = 2.59$, $p = .010$. With respect to Research Question 3, excluded cases were more likely to be male ($\chi^2 = 5.31$, $p = .016$), have ADHD ($\chi^2 = 4.34$, $p = .027$), and have higher total ADHD severity, $t(449) = 2.09$, $p = .037$. Finally, for Research Question 4, excluded cases had fewer non-ADHD diagnoses relative to included cases, $t(108.19) = 2.27$, $p = .025$.

Classification Measures

Demographic data.—Participants provided a range of demographic information including age, gender, race, ethnicity, parental education, and parental occupation. Participants were also asked to report both of their parents' highest level of education and indicate both of their parents' occupations. For the present study, parent education was coded according to the highest educational level attained by either of the student's parents. 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 based on the 2000 U.S. Census and provides a score that ranges from 0 to 99.

ADHD Rating Scale–Self-Report Version (ADHD RS-SRV).—The ADHD RS-SRV, developed specifically for the purposes of this study, is a modified version of the ADHD RS-IV (DuPaul, Power, Anastopoulos, & Reid, 1998). Like its predecessor, the ADHD RS-SRV lists the inattention (IN) and hyperactive-impulsive (HI) symptoms in alternating fashion, and the frequency of occurrence for each symptom can be rated as: 0 (*never or rarely present*) to 3 (*very often present*). Summing the number of items scored 2 or 3 yields symptom frequency counts for both IN and HI, which were used for eligibility screening. The ADHD RS-SRV addresses ADHD symptoms both during childhood and during the past 6 months, while also taking into account medication status. Internal consistency reliability data suggest very good (.74) to excellent (.94) for the childhood and past 6 months reports of both IN and HI symptoms, regardless of medication status.

ADHD Rating Scale–Parent-Report Version (ADHD RS-PRV).—The ADHD RS-PRV is a modified version of the ADHD RS-IV (DuPaul et al., 1998), requiring parents to rate their child's ADHD symptoms during both childhood and the past 6 months. For participants with histories of taking ADHD medication, parents were instructed to provide ratings based on their child's status when not taking medication. The format and scoring of the ADHD RS-PRV are similar to that of the ADHD RS-SRV. The ADHD RS-PRV has demonstrated excellent internal consistency (.89-.94).

Semi-Structured Interview for Adult ADHD.—The Semi-Structured Interview for Adult ADHD was developed specifically for the TRAC Study to provide an assessment of functional impairment at the ADHD symptom level, accounting for medication status. Participants are asked to rate symptoms at times when not taking medication. Coefficient alphas for both the IN and HI portions of the interview were excellent (.90 and .85, respectively).

Expert panel classification.—The expert panel consisted of four PhD-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 present study was based on the unanimous decision reached by the four-member expert panel. In addition, the expert panel made final decisions regarding psychological classifications (e.g., anxiety or mood disorder) that may have been exclusionary or comorbid with ADHD. 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).—The SCID-I (First, Spitzer, Gibbon, & Williams, 1996) is a structured interview that systematically addresses mood, anxiety, and other Axis I disorders in accordance with *DSM-IV-TR* (4th ed., text rev.; APA, 2000) criteria. For the present 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 (BDI-II).—The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report measure for measuring the severity of depression in adults and adolescents 13 years and older. The BDI-II has been found to have strong internal consistency among college students ($\alpha = .93$). In addition, data have indicated adequate test–retest correlations across multiple studies (Beck et al., 1996; Sprinkle et al., 2002).

Beck Anxiety Inventory (BAI).—The BAI (Beck & Steer, 1993) is a 21-item scale that measures anxiety in adults and adolescents 17 years and older. The BAI has been found to have adequate internal consistency ($\alpha = .92$) and test–retest reliability (Beck & Steer, 1993; De Ayala, Vonderharr-Carlson, & Kim, 2005).

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). In addition, 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–Second Edition (WASIII), which has very good to excellent reliability and validity (Wechsler, 2011). All assessments were administered by graduate students or postdoctoral researchers in clinical and school psychology.

Precollege service use.—Data regarding the student's precollege service use were obtained via self-report on the Services for College Students Interview (SCSI)–Precollege Version, a semistructured interview designed for the TRAC Project. This interview asks students whether 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 Individualized Education Plan (IEP), 504, or informal accommodations. For the purposes of the present study, precollege service use was captured dichotomously (i.e., present or absent).

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 whether they received one of the following: "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." If participants indicated they had accessed a given service, they were asked to report how frequently they utilized that support using a 4-point scale where 1 = 1–2 times, 2 = 3–4 times, 3 = 5–9 times, and 4 = 10 or more times. The service use variable used in the present study therefore ranged from 0 to 4 (i.e., *never used* to *10 or more times*).

Procedures

All procedures for the larger study were initially approved by the institutional review board (IRB) of all three project sites. Students were recruited through a combination of electronic postings on Facebook, campus-wide emails, 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 semistructured 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 RS-PRV to the student's parent for his or her ratings.

During the second meeting, participants completed a range of measures regarding their psychological functioning including the BAI and the BDI-II. In addition, participants were administered the SCID by graduate students and PhD-level staff with training in clinical and school 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-II), social, and vocational functioning and completed measures regarding their precollege 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 US$100 for their participation during that academic year, a summary report from the data collected during that academic year, and feedback was provided as needed.

Data Analytic Plan

To answer the research questions, a series of multivariate analyses of covariance (MANCOVAs) and regression analyses were conducted using SPSS v. 21® software (IBM Corp, 2011). Medication use was controlled for in all analyses in the present study given the documented effectiveness of medication for ADHD symptomology in adults (Prince, Wilens, Spencer, & Biederman, 2015).

To determine whether there were significant differences between the GPAs of students with and without ADHD, a 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. To determine predictors of GPA, four hierarchical multiple regression analyses were used (i.e., ADHD Fall GPA, ADHD Spring GPA, Comparison Fall GPA, and Comparison Spring GPA). In addition, Fisher's z test (Garbin, n.d.) was used to determine whether the magnitude of prediction was equal across groups. For the current analysis, the two-tailed z-critical value was 1.96 for $p < .05$ and 2.58 for $p < .01$.

To determine whether the rate of disability and academic support service use among students with ADHD significantly differed from students with other disabilities and to those without any current disability, a seven-group—ADHD alone ($n = 74$), ADHD + Anxiety ($n = 20$), ADHD + Mood ($n = 31$), ADHD + Other ($n = 23$), ADHD + Multiple ($n = 60$), non-ADHD psychological disorder ($n = 25$), no psychological disorder ($n = 203$)—MANCOVA was conducted for six dependent variables including frequency of (a) meetings with professors or academic advisors, (b) tutoring sessions, (c) academic skills assistance, (d) writing or speaking assistance, (e) career counseling, and (f) disability service accommodation use. As discussed previously, ADHD status was determined using the *DSM-5* diagnostic criteria for ADHD. Other psychiatric conditions were based on 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 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., 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 an adjustment disorder, obsessive-compulsive or related disorder, learning disability, or eating disorder. Participants in the ADHD + Multiple category consisted of students meeting criteria for ADHD and two or more additional diagnoses. 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 ANCOVAs were conducted to determine specific differences following any statistically significant MANCOVA results. Partial eta squared was calculated to provide an estimate of the magnitude of obtained between group differences.

To investigate what variables predict service use in college, a backward stepwise multiple regression was used given this procedure reduced the likelihood of making a Type II error relative to the forward method (Field, 2009). Finally, to determine whether self-reported service use predicted improved academic outcomes, a hierarchical multiple regression analysis was employed to predict cumulative first-year GPA. Blocks were grouped conceptually (i.e., demographic and educational) based on 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 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.

Results

Descriptive statistics for this analysis are included in Table 2. 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 ANCOVAs indicated that comparison students had significantly higher high school, $F(1) = 29.15$, $p < .001$, partial $\eta^2 = .096$;, fall semester, $F(1) = 9.96$, $p = .002$, partial $\eta^2 = .035$; and spring semester, $F(1) = 6.29$, $p = .013$, partial $\eta^2 = .022$, GPA relative to students with ADHD.

Predictors of GPA

Descriptive statistics for Research Question 2 are listed in Table 2. The first level of model predicting the first-semester GPA of students with ADHD did not reach statistical significance ($p = .056$). 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 did not significantly impact the total variance explained ($R^{2\Delta} = .01$, $p = .318$). Among coefficients, only gender significantly predicted first-semester GPA for college students with ADHD ($\beta = -.408$, $p = .015$) such that being male was related to lower first-semester GPA (see Table 3). The regression analysis predicting the second-semester GPA of students with ADHD failed

to reach statistical significance at all levels (*p*s = .059, .061, and .086, respectively; see Table 3).

The first level of the regression analysis predicting firstsemester GPA among college students without ADHD did not reach statistical significance ($p = .157$). 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 did not significantly impact total variance explained ($R^{2\Delta} < .001$, $p = .838$). Among coefficients, high school GPA ($\beta = .409$, $p < .001$) and WIAT Essay Composition ($\beta = .157$, $p = .049$) positively and significantly predicted first-semester GPA (see Table 4).

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. 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 did not significantly affect total variance explained ($R^{2\Delta} < .001$, $p = .890$). Among coefficients, gender ($\beta = -.244$, $p = .005$), ethnicity ($\beta = .187$, $p = .046$), and high school GPA ($\beta = .382$, $p < .001$) 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 (see Table 4).

To test whether 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 failed to reach statistical significance for first-semester ($z = 1.114$, $p > .05$) and second-semester ($z = 1.120$, $p > .05$) GPA.

Rate of Service Use

Descriptive statistics regarding the rate of service use by group are listed in Table 5. Percentage of students using any type of services ranged from 65.5% (ADHD + Mood) to 89.5% (ADHD + Other). 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 47.1% (ADHD + Anxiety) to 73.7% (ADHD + Other; see Table 5). 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 on 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. A logarithmic transformation was unable to normalize data. 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, $F(6, 413) = 1.550$, $p = .161$.

Results of the final ANCOVA indicated that groups did not differ significantly from each other in terms of service use, $F(6, 415) = 1.529$, $p = .167$ partial $\eta^2 = .022$. Given small size of some subgroups (e.g., ADHD + Anxiety, $n = 20$), 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, $F(3, 415) = 1.794$, $p = .148$. 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 broader set of ADHD groups and the log transformation of service use frequency of all services except meetings with professors or advisors. Results of this analysis also failed to reach statistical significance, $F(6, 415) = 1.288$, $p = .261$, partial $\eta^2 = .018$. A final analysis was attempted using the reduced, four-group model previously described and the modified service use variable. Results of this analysis were not statistically significant, $F(3, 415) = 1.379$, $p = .249$.

Predictors of Service Use

Results of the backward stepwise multiple regression are reported in Table 6. Gender, ethnicity, race, parent education, parent job prestige, ADHD symptom severity, precollege 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 11 iterations. The final model was statistically significant, $F(2, 386) = 19.566$, $p < .001$, and accounted for 9.2% of the total variance. There were two remaining statistically significant predictors: student race ($\beta = .131$, $p = .008$) and precollege service use ($\beta = .295$, $p < .001$). Specifically, results indicated that being non-White and receiving precollege academic services both predicted higher frequency of college service use.

Outcomes of Service Use

The first level of the regression model consisting of demographic variables predicting first-semester GPA was statistically significant, $F(7, 212) = 4.021$ $p < .001$, accounting for 11.7% of the total variance (see Table 7). The addition of educational predictors was also statistically significant, $F^{\Delta}(6, 206) = 11.562$, $p < .001$, uniquely accounting for 22.2% 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, $F^{\Delta}(1, 205) = .100$, $p = .752$. Gender ($\beta = -.141$, $p = .019$), high school GPA ($\beta = .332$, $p < .001$), and WIAT essay composition scale score ($\beta = .154$, $p = .012$) 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, $F(6, 212) = 4.019$, $p < .001$, accounting for 11.8% of the total variance. The addition of educational predictors was also statistically significant, $F^{\Delta}(6, 205) = 3.907$, $p = .001$, uniquely accounting for 9.1% of the variance with 20.8% of the total

variance explained. The addition of service use failed to result in statistically significant R^2 change, $F^{\Delta}(1, 205) = 0.065$, $p = .799$. Only gender ($\beta = -.208$, $p = .002$) and high school GPA ($\beta = .242$, $p = .001$) 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 (see Table 7).

Discussion

The present study sought to expand the extant literature regarding college students with ADHD by (a) examining differences in high school and college GPA using a relatively large, rigorously defined, multisite 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.

Consistent with the initial hypothesis, current results replicated past findings that students with ADHD earn lower high school and college GPAs relative to students without ADHD (Advokat et al., 2011; Lewandowski, Gathje, Lovett, & Gordon, 2013). 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 present study analyzed GPA at three time points separately. Interestingly, the data suggest a trend such that the effect size of group differences on GPA decreases 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. Although the differences in effect size 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 in GPA among students with ADHD is a product of restricted range. 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. Finally, the narrowing of effect size may also be explained by the uniqueness of the subsample of students with ADHD included in this analysis. Excluded cases were more likely to have ADHD, higher ADHD severity, and more psychiatric diagnoses; therefore, it is possible that the students with ADHD included in this analysis represent a particularly high-functioning subgroup of the larger study sample. Results regarding predictors of academic performance replicate previous research indicating that females with and without ADHD generally obtain higher GPAs than do males (Kuh, Cruce, Shoup, & Kinzie, 2008; Langberg, Dvorsky, Becker, & Molitor, 2014). Consistent with previous work, current results suggested that high school GPA is predictive of college GPA (Ackerman, Kanfer, & Beier, 2013; Kuh et al., 2008). With respect to racial and ethnic status among the ADHD group, results mirror those in previous studies suggesting a negative impact of ethnic and/or racial minority status (Hoffman & Lowitzki, 2005; Kuh et al., 2008). The reversal of this effect among non-ADHD students suggests that the relationship between racial and ethnic diversity and GPA is complex and warrants additional research.

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, 2008). In addition, 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 previous research, 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 (e.g., FSIQ, WIAT) that may have captured variance that would have otherwise been attributed to the SAT score. It is possible that the present analysis may represent the most robust and unique predictors of first-year GPA at the fall and spring semesters. Furthermore, previous studies did not consider students with ADHD specifically. Given the deficits associated with ADHD, performance on high-stakes tests such as the SATs may not be as meaningful in a predictive context as other background factors (e.g., parental supports, K-12 academic engagement).

The present results indicated significantly higher rates of service use among participants relative to previous studies (45%; Chew et al., 2009). The higher rate of service utilization may be due to the inclusion of 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. Interestingly, the present study did not find significant differences in service use among disability classifications. This finding may be due to small cell sizes of the comorbid groups, or may indicate that students with disabilities do not seek out academic support services during their first year at college.

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, student race and precollege service use were significantly predictive of college service use. The emergence of precollege service use as the strongest predictor of college service use is not surprising given the proportion of students who qualify for formal disability support services is higher among students who previously have utilized services (i.e., have a diagnosed disability). The higher rates of service use among students from diverse racial and ethnic backgrounds relative to White students is more difficult to interpret given previous work suggesting that these individuals are less likely to be both diagnosed with a disorder and to seek out services (Morgan, Staff, Hillemeier, Farkas, & Maczuga, 2013; Snowden, 2003). This 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).

Contrary to initial hypotheses and extant literature, current results suggested that service use during college did not independently predict GPA during either semester. It is possible that the range of factors included in the current analysis could explain this difference. For example, Matthews, Croft, Lawson, and Waller (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. Furthermore, the present study is a more rigorous analysis of academic support services and may highlight the limitations of such supports to independently impact academic functioning. Alternatively, simply utilizing academic services may be necessary but insufficient to improve academic outcomes (Pell & Croft, 2008). Given that the lack of data regarding service quality and level of engagement within sessions by the students, it is possible that these findings represent the minimal effectiveness of college academic support services. Furthermore, the correlational nature of this study precludes interpretation of causality. For example, more motivated or anxious students may seek out services despite not needing them.

Limitations and Future Directions

The current findings are important as they suggest significant impairments for college students with ADHD and gaps in our current supports for these students; however, these results must be evaluated in light of the limitations of the study design. First, the present sample consists only of firstyear students enrolled at 4-year institutions despite less than one third of individuals with ADHD attend such institutions (Kuriyan et al., 2013). Future work should compare the functioning of individuals with ADHD across institution type (e.g., vocational, community and 4-year schools). Similarly, future research should describe student functioning in subsequent years and identify how data from a student's first year in college predicts later functioning.

Examination of a broader range of predictors for academic success in college is also needed. For example, study habits or motivation to succeed academically may better predict student GPA relative to the predictors included here. Such information could be informative for admissions decisions, and may also allow for the development of meaningful accommodations and interventions for this population.

Data limitations, specifically the nonnormality 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 and the nonsignificant relationship between disability status and service use. It is possible that by grouping all services into a single variable, significant effects of a given service were masked. Small cell sizes for the comorbidity analyses (i.e., two groups under 20 participants) limit the applicability of those findings, and may explain nonsignificant findings regarding disability status and service use. In addition, the present analyses were constrained by missing data (7.89%−51.75% depending on the analysis). The variable sample sizes were limiting in at least two ways. First, although the majority of students appeared in all analyses, changes in the sample at the analysis level limits our ability to draw across all analyses (i.e., each subsample is not the same). Second, given that initial comparisons indicated that students who failed to return for all portions of the assessment procedure were more likely to have higher levels of ADHD severity scores, and were more likely to have nonADHD diagnoses, the present results may represent a less impaired subsample of the larger ADHD population. Furthermore, 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.

Additional studies are needed to better track student's use of academic service (e.g., sign-in/out logs, card swiping).

Furthermore, other measures of academic success in college may be warranted given the limitations of GPA as an outcome variable. Specifically, GPAs may vary by academic major such that students with STEM majors (e.g., chemistry) generally have lower average GPAs relative to non-STEM majors (e.g., education; Rask, 2010). Similarly, because grading practices are not standardized or checked for reliability or validity, it is possible that grade inflation can occur. This may also contribute to differing GPAs by major as STEM courses likely have fewer subjective assignments (e.g., essays) relative to objective assignments (e.g., multiple choice). Finally, because GPAs are not standardized across institutions, it is difficult to compare the same GPA at two universities both within and across campus type (e.g., private vs. public university). Future work should consider other measures of success (e.g., graduation rates, postgraduate employment) or control for potentially confounding factors (e.g., academic major).

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 could 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 disability status to predict service use indicates that those students with the greatest 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.

Conclusion

Despite the limitations of the present study, and the need for additional research, the current findings make substantive contributions to the extant literature in several ways. First, the present study extended prior research by demonstrating significantly lower GPAs among a large, rigorously defined, multisite sample of first-year college students with ADHD relative to students without ADHD. Second, this study suggests 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 results of the present study 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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Author Biographies

Matthew J. Gormley, MEd, is a doctoral student in the School Psychology program at Lehigh University and is on internship at the Munroe-Meyer Institute. His research interests focus on the development and implementation of interventions and services delivery methods to ensure continuous high-quality support for individuals with ADHD through both major and minor transitions across the lifespan.

George J. DuPaul, PhD, is professor of School Psychology at Lehigh University (Bethlehem, PA). His research interests include assessment and treatment of ADHD across the lifespan, school based intervention for students with behavior disorders, and pediatric school psychology.

Lisa L. Weyandt, PhD, is a professor at the University of Rhode Island, Department of Psychology, and a member of the

Interdisciplinary Neuroscience Program. Her interests include ADHD in college students, prescription stimulant misuse, executive functions, and clinical neuroscience.

Arthur D. Anastopoulos, PhD, is a professor in the Department of Human Development and Family Studies at the University of North Carolina at Greensboro, where he also directs an ADHD specialty clinic. His research focuses on the manner in which ADHD unfolds across the lifespan, with a current interest in the assessment and treatment of college students with ADHD.

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Table 1.

Sample Size by Analysis.

Analysis	Total *N*	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	387	195	192
Outcomes of service use	220	99	121

Note. GPA = grade point average.

Table 2.

Means, Standard Deviations, and Effect Size by Group.

	ADHD *M* (*SD*)	Control *M* (*SD*)	*t* or χ^2	Cohen's *d*
Fall GPA	2.91 (0.77)	3.26 (0.69)	−4.92***	−0.48
Spring GPA	2.79 (0.84)	3.13 (0.82)	−3.79***	−0.41
Gender (% male)	55% (0.50)	45% (0.50)	0.04	0.20
Ethnicity (% non-Hispanic)	91% (0.29)	89% (0.31)	0.02	0.07
Race (% White)	79% (0.41)	69% (0.46)	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% (0.50)	NA	NA	NA
HS GPA	3.44 (0.50)	3.82 (0.46)	−6.06***	−0.79
SAT Tot	1,177.37 (186.17)	1,190.66 (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
Essay Composition	113.47 (11.24)	116.78 (10.17)	−2.25*	−0.31
Diagnoses	1.00 (1.01)	0.21 (0.55)	10.26***	0.97

Note. GPA = grade point average; 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; WASI = Wechsler Abbreviated Scale of Intelligence; WIAT = Wechsler Individual Achievement Test.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 3.

Final Regression Statistics for Model Predicting GPA Among Students With ADHD by Semester.

Semester	Variable	R/B	R^2/β	SE	*p* value	ANOVA *F*	Model *p*
First		.529	.280	0.705	.318	2.543	.005
	Gender	−.408	−.264	0.165	.015		
	Ethnicity	−.363	−.136	0.264	.173		
	Race	−.007	−.004	0.197	.970		
	Parent Ed	.067	.094	0.078	.395		
	Parent Job	.000	−.001	0.004	.991		
	ADHD Med Status	−.019	−.012	0.159	.905		
	HS GPA	.274	.176	0.170	.111		
	FSIQ	.008	.137	0.007	.255		
	SAT Total	.000	.092	0.014	.580		
	Word Reading	.001	.004	0.014	.970		
	Numerical Operations	.002	.039	0.007	.774		
	Essay Composition	.011	.156	0.007	.131		
	Diagnoses	−.102	−.114	0.101	.318		
Second		.452	.204	0.805	.704	1.656	.086
	Gender	−.263	−.157	0.190	.169		
	Ethnicity	−.699	−.242	0.302	.023		
	Race	.012	.006	0.225	.956		
	Parent Ed	−.077	−.100	0.090	.392		
	Parent Job	.004	.091	0.004	.429		
	ADHD Med Status	−.023	−.014	0.181	.900		
	HS GPA	.183	.107	0.198	.358		
	FSIQ	.004	.071	0.008	.574		
	SAT Total	−.001	−.158	0.001	.365		
	Word Reading	.006	.047	0.016	.697		
	Numerical Operations	.007	.116	0.008	.409		
	Essay Composition	.016	.218	0.008	.046		
	Diagnoses	.044	.045	0.115	.704		

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Note. GPA = grade point average; 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; WASI = Wechsler Abbreviated Scale of Intelligence; WIAT = Wechsler Individual Achievement Test.

Table 4.

Final Regression Statistics for Model Predicting GPA Among Students Without ADHD by Semester.

Semester	Variable	R/B	R^2/ß	SE	p value	ANOVA F	Model p
First		.640	.410	0.555	.838	6.251	<.001
	Gender	-.132	-.096	0.109	.229		
	Ethnicity	.362	.164	0.190	.058		
	Race	-.042	-.028	0.129	.747		
	Parent Ed	.059	.126	0.047	.205		
	Parent Job	-.003	-.084	0.003	.326		
	HS GPA	.614	.409	0.126	<.001		
	FSIQ	.001	.022	0.006	.809		
	SAT Total	.001	.202	0.000	.094		
	Word Reading	.005	.040	0.010	.645		
	Numerical Operations	.002	.045	0.005	.652		
	Essay Composition	.011	.157	0.005	.049		
	Comorbid Dx	-.019	-.016	0.094	.838		
	Diagnoses	.044	.045	0.115	.704		
Second		.566	.321	0.708	.890	4.248	<.001
	Gender	-.398	-.244	0.140	.005		
	Ethnicity	.490	.187	0.242	.046		
	Race	-.171	-.097	0.167	.306		
	Parent Ed	.069	.123	0.059	.241		
	Parent Job	-.002	-.044	0.003	.634		
	HS GPA	.672	.382	0.157	<.001		
	FSIQ	.003	.035	0.007	.721		
	SAT Total	.001	.186	0.001	.151		
	Word Reading	-.006	-.042	0.012	.651		
	Numerical Operations	-.002	-.040	0.006	.710		
	Essay Composition	.000	-.005	0.007	.949		
	Diagnoses	.017	.012	0.120	.890		

Note. GPA = grade point average; 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;

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Essay Composition = WIAT numerical operations standard score; Diagnoses = number of non-ADHD psychiatric conditions; WASI = Wechsler Abbreviated Scale of Intelligence; WIAT = Wechsler Individual Achievement Test.

Table 5.

Percentage of Students Using Services by Group.

Service	Control%	Dx'd Control%	ADHD%	ADHD + Mood%	ADHD + Anxiety%	ADHD + Other%	ADHD + Multiple%
Any	75.4	88.0	69.9	65.5	82.4	89.5	78.3
Advisor meeting	59.4	79.2	66.3	44.0	80.0	77.8	66.7
Any (not advisor)	54.7	64.0	54.4	62.1	47.1	73.7	60.0
Tutoring	40.6	37.5	36.0	40.0	33.3	41.2	36.2
Academic skills	14.1	29.2	20.2	20.0	13.3	27.8	26.3
Writing/speaking	18.2	16.7	22.5	36.0	26.7	27.8	29.8
Career counseling	16.7	8.3	14.6	24.0	6.7	0.0	10.5
Disability services	2.1	8.3	24.7	20.0	13.3	50.0	26.3

Note. Dx'd Control = Comparison student meeting criteria for a non-ADHD psychiatric condition; Any (not Advisor) = percentage 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 = diagnosis of ADHD and two or more disorders.

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Table 6.

Regression Statistics for Full and Final Models Predicting Service Use.

Model	Variable	R/B	R^2/β	SE	p value	ANOVA F	Model p
Full		.317	.072	2.79	<.001	3.483	<.001
	Gender	−.200	−.035	0.305	.512		
	Ethnicity	.282	.028	0.521	.588		
	Race	.859	.134	0.347	.014		
	Parent Ed	.034	.017	0.119	.775		
	Parent Job	.000	.004	0.007	.947		
	Symptom Severity	.004	.020	0.021	.838		
	Pre Col. Serv. Use	1.629	.273	0.338	<.001		
	Cumulative GPA	.176	.046	0.206	.392		
	FSIQ Score	−.007	−.030	0.012	.567		
	Group	−.077	−.013	0.609	.900		
	Diagnoses	−.007	−.004	0.113	.953		
	ADHD Medication	.293	.044	0.416	.482		
Final		.304	.092	2.77	.276	19.566	<.001
	Race	.841	.131	0.316	.008		
	Pre Col. Serv. Use	1.780	.298	0.295	<.001		

Note: Parent Ed = highest parent educational level; Parent Job = highest parent occupational prestige score; Sym. Severity = ADHD symptom severity; Pre Col. Serv. Use = precollege 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 7.

Final Regression Statistics for the Model of Service Use Predicting GPA by Semester.

Semester	Variable	*R*/B	R^2/β	SE	*p* value	ANOVA *F*	Model *p*
First		.583	.340	0.625	.752	7.541	<.001
	Group	.100	.074	0.115	.341		
	Gender	−.210	−.141	0.089	.019		
	Ethnicity	.046	.019	0.156	.767		
	Race	−.001	−.001	0.111	.990		
	Parent Ed	.055	.100	0.039	.163		
	Parent Job	−.001	−.042	0.002	.527		
	ADHD Med	−.006	−.003	0.132	.967		
	HS GPA	.484	.332	0.099	<.001		
	FSIQ Score	.003	.052	0.004	.449		
	Word Read.	.003	.021	0.008	.746		
	Num. Oper.	.003	.057	0.004	.467		
	Essay Comp.	.011	.154	0.004	.012		
	SAT Total	.001	.134	0.000	.148		
	Tot. Serv. Use	−.005	−.019	0.014	.752		
Second		.457	.208	0.774	.799	3.837	< .001
	Group	.102	.061	0.142	.473		
	Gender	−.350	−.208	0.110	.002		
	Ethnicity	−.126	−.045	0.193	.515		
	Race	−.083	−.044	0.139	.549		
	Parent Ed	.015	.024	0.049	.756		
	Parent Job	.000	.002	0.003	.973		
	ADHD Med	−.071	−.035	0.164	.667		
	HS GPA	.401	.242	0.123	.001		
	FSIQ Score	.003	.043	.005	.572		
	Word Read.	−.006	−.046	0.010	.527		
	Num. Oper.	.003	.053	0.005	.540		
	Essay Comp.	.008	.106	0.005	.114		

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Semester	Variable	*R*/B	R^2/β	SE	*p* value	ANOVA *F*	Model *p*
	SAT Total	.000	.040	0.000	.696		
	Tot. Serv. Use	−.005	−.017	0.018	.799		

Note. GPA = grade point average; 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 = precollege service use; WASI = Wechsler Abbreviated Scale of Intelligence; WIAT = Wechsler Individual Achievement Test.