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Trevor D. Pinho

Patricia H. Manz

George J. DuPaul

Arthur D. Anastopoulos

Lisa Weyandt

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Predictors and Moderators of Quality of Life Among College Students With ADHD

Trevor D. Pinho[1], **Patricia H. Manz**[2], **George J. DuPaul**[2], **Arthur D. Anastopoulos**[3], **Lisa L Weyandt**[4]

[1]Whitehall-Coplay School District, PA, USA

[2]Lehigh University, Bethlehem, PA, USA

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

[4]University of Rhode Island, Kingston, USA

Abstract

Objective: The current study examines (a) whether ADHD among college students is associated with differences in perceptions of quality of life (QoL); (b) the moderating roles of comorbidity, drug use, psychopharmacological treatment, and psychosocial treatment; and (c) the total impact of these variables on QoL.

Method: Participants were college students with and without ADHD (N = 372) in a longitudinal study.

Results: College students with ADHD were more likely to assert negative global QoL evaluations relative to non-ADHD peers. The relationship between ADHD and QoL was not altered as a function of medication treatment, comorbid psychopathology, psychosocial treatment, or drug use.

Conclusion: College students with ADHD behave similarly to other adults with ADHD in that they make lower subjective global evaluations of their QoL relative to their non-ADHD agemates. Other factors associated with ADHD and QoL do not appear to moderate this relationship. (J. of Att. Dis. XXXX; XX(X) XX-XX)

Keywords

ADHD; quality of life; college students

ADHD is a neurodevelopmental disorder characterized by hyperactivity-impulsivity and/or inattention (American Psychiatric Association [APA], 2013). Prior to the 1990s, ADHD was predominantly considered to be a childhood disorder (Biederman et al., 1993). Although most research examining ADHD has continued to focus on children, research has

Corresponding Author: Trevor D. Pinho, Whitehall-Coplay School District, 2940 MacArthur Road, Whitehall, PA 18052-3408, USA. trevor.pinho@gmail.com.

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increasingly recognized the chronicity of ADHD across the life span, including attention specific to college students (e.g., Weyandt & DuPaul, 2006).

Although rates of college enrollment are greater for young adults without ADHD, increasingly large portion of young adults with ADHD are enrolling in college (Barkley, 2015; Weyandt & DuPaul, 2006). In the United States, approximately 6% of students in the enrolling 2014 cohort reported having been diagnosed with ADHD, which makes it the most common disability among college students (Eagan et al., 2014).

College students with ADHD are unique when compared with the general adult ADHD population. First, because these students have successfully gained admission into colleges and universities, they may represent the most successful and resilient portion of children and adolescents with ADHD (Frazier, Youngstrom, Glutting, & Watkins, 2007; Green & Rabiner, 2012). Second, the transition to college generally coincides with the removal of structure that may minimize the impact of ADHD such as parental supervision, informal classroom accommodations, and a highly structured course schedule (Green & Rabiner, 2012; Meaux, Green, & Broussard, 2009; Wolf, Simkowitz, & Carlson, 2009).

Research to inform practice has lagged behind the growing need for universities to support students with ADHD. Several reviews of relevant literature (e.g., Weyandt & DuPaul, 2006; Weyandt & DuPaul, 2008) note methodological weaknesses in studies focused on this population. Many studies rely solely on clinical populations, such as students receiving counseling services or who formally register on their campuses as students with disabilities. Although these students tend to be identified using strict criteria, they likely represent approximately one third of college students with ADHD, as most students with ADHD do not register for such services (Advokat, Lane, & Luo, 2011). In addition, studies that address the impact of ADHD by drawing from the broader college community tend not to rigorously confirm diagnoses and/or reach conclusions about students with ADHD based on predominantly subclinical symptoms. With these limitations noted, several studies have investigated whether differences noted in other adults with ADHD extend to college students.

Studies of academic outcomes of college students with ADHD have consistently found that students with this disorder tend to perform worse than their peers without ADHD on indicators of academic success, such as grade point average (GPA) and course failure (Blase et al., 2009; DuPaul, Weyandt, O'Dell, & Varejao, 2009; Weyandt & DuPaul, 2006, 2008). In a meta-analysis concerning the relationship between ADHD and achievement across 72 studies, Frazier and colleagues (2007) found a moderate effect of ADHD on the academic achievement of adults ($d = .57$). In contrast to academic functioning, psychosocial functioning is relatively understudied in college students with ADHD (DuPaul et al., 2009), and studies reviewing psychosocial impairment have been equivocal (Blase et al., 2009; DuPaul et al., 2009; Weyandt & DuPaul, 2006, 2008).

Quality of life (QoL), or the subjective and objective evaluations made by individuals about their life functioning and satisfaction, is gaining recognition as a critical psychosocial outcome for individuals with disabilities, like those with ADHD. Many studies have

investigated whether individuals with ADHD differ from individuals without ADHD with regard to QoL. A systematic review of 36 studies investigating QoL in children with ADHD indicates that QoL is similar among children with and without ADHD when the child is self-reporting QoL, but that parents of children with ADHD tend to rate their child's QoL lower than the parents of children without ADHD (Danckaerts et al., 2010). A similar review of QoL in adults with ADHD across 36 studies found that adults with ADHD rate their QoL significantly lower than their peers without ADHD (Agarwal, Goldenberg, Perry, & Ishak, 2012). Taken together, these two reviews of 72 studies suggest that adults, but not children, with ADHD tend to consider their lives to be of lower quality than their peers.

Despite the various studies of QoL in adults with ADHD, only two investigations to date have inspected the impact of ADHD on college students. First, Gudjonsson, Sigurdsson, Eyjolfsdottir, Smari, and Young (2009) found ADHD symptoms to be related to lower QoL. Although this study benefited from using a large community-based sample, it suffered from failing to confirm diagnoses and a low overall symptom severity (e.g., only a single participant reported symptoms severe enough to suggest the presence of ADHD). Second, Grenwald-Mayes (2001) compared QoL between a small group of students with ADHD who were identified by academic resource centers and a group of comparison students without ADHD. Using comprehensive measurement of global and domain-specific QoL, they found students with ADHD to have lower scores in only four of 15 domains and failed to find global differences. Taken together, although there is preliminary evidence to suggest that QoL may be lowered by the presence of ADHD, no study to date has definitively found such a difference using a large and representative sample of college students who have been properly identified with ADHD.

Moderators of QoL Among College Students With ADHD

Discerning potential moderating variables that are relevant to QoL and ADHD among college students could expand opportunities for intervention through highlighting different areas or modalities through which QoL of college students with ADHD might be improved. First, there is ample evidence that individuals with ADHD are at risk for additional psychiatric diagnoses, and that these diagnoses may further reduce QoL above and beyond ADHD alone (Anastopoulos et al., 2016; Weyandt et al., 2013). Second, the use of alcohol, tobacco, and other drugs (ATOD), a common problem at colleges in the United States, has special relevance to college students with ADHD as these students tend to use substances such as alcohol at a greater rate than their peers (Glass & Flory, 2012; Higher Education Research Institute, 2011; Wolf, 2001), and problems associated with substance use predict reductions in the QoL of college students (Murphy, Hoyme, Colby, & Borsari, 2006). Third, psychotropic medication (chiefly stimulants) is the most commonly accessed treatment for college students with ADHD and has been found to improve QoL in adults with ADHD and to reduce ADHD symptoms among college students with ADHD (Advokat et al., 2011; Blase et al., 2009; DuPaul et al., 2012). Finally, colleges offer a number of services designed to improve the QoL of college students with disabilities such as ADHD. Recent research provides preliminary evidence supporting psychosocial interventions for college students with ADHD (e.g., Anastopoulos & King, 2015; Canu & Wymbs, 2015; LaCount, Hartung, Shelton, Clapp, & Clapp, 2015).

Purpose and Description of Current Study

The current study seeks to build on extant research by (a) following a large sample of general population college students with confirmed diagnostic statuses over time, thereby overcoming a number of methodological limitations often found in studies of college students with ADHD, and (b) investigating the relationship between QoL and a number of other services and behaviors relevant to college students with ADHD.

To achieve these goals, the current study examined three research questions. First, does ADHD status at college entry predict differences in subjective global QoL during the second year of college? It was hypothesized that college students with ADHD would report lower QoLs than those without ADHD. Second, does comorbid psychopathology, problematic use of ATOD, use of medication to manage ADHD symptoms, and/or the use of psychosocial treatment moderate the predictive relationship between ADHD status and student-reported QoL? It was hypothesized that the relationship between ADHD and QoL would be mitigated (i.e., smaller) in the presence of psychosocial treatment or medication and exacerbated (i.e., larger) in the presence of additional psychopathology or problematic use of ATOD. Finally, among college students with and without ADHD, to what extent is subjective global QoL predicted by the statistically significant variables and interactions identified in Research Questions 1 and 2? Given the exploratory nature of this question, hypotheses were not advanced.

Method

Participants

Participants for the current study were drawn from the Trajectories Related to ADHD in College (TRAC) Project, which is a longitudinal study following two cohorts of college students with and without ADHD. Participants included in the full study were recruited during their first year at any of nine different universities and colleges in the Eastern United States. Participants needed to meet criteria for either the ADHD or comparison groups as captured by the Adult ADHD Rating Scales and Semi-Structured ADHD Interview (see below for complete criteria for the two experimental groups). Individuals who indicated some but not all criteria for the ADHD group, including those who indicated a high level of ADHD symptoms during childhood but a low level of current symptoms, were excluded from the study. The resulting sample included 456 participants (51.8% female) who enrolled in college in the fall semesters of 2012 and 2013. This included 228 participants in the ADHD group and 228 participants in the comparison group. The sample was balanced across the two groups with respect to age, gender, race, and ethnicity (see Anastopoulos et al., 2016, for a full description of the sample and procedures).

The current study draws from the first 2 years of each cohort's participation in the TRAC study. Due to the longitudinal nature of the study, some students were lost to attrition between their first and second years of college. The current study is composed of participants who contributed data for their first 2 years of college, which includes more than 80% of the total sample (see Table 1). A series of *t* tests found that individuals who did not continue in the study were more likely to be male, $t(454) = -2.05$, $p = .041$, and in the

ADHD group, $t(454) = -3.67$, $p < .001$, but were equal with respect to IQ, age, ethnicity, and racial distribution ($ps \geq .05$).

Constructs and Measures

ADHD status.—ADHD status for the purposes of the research project was determined by a panel of four doctoral-level psychologists who considered the findings of the Adult ADHD Rating Scales and Semi-Structured ADHD Interview measures in making their diagnostic decision. The panel also reviewed the results of measures relevant to other psychological diagnoses in order to establish whether another diagnosis (e.g., anxiety) better accounted for an individual's symptoms. This panel of psychologists was composed of the three primary investigators for the TRAC Project, each of whom has expertise in assessing for ADHD and other psychopathology, as well as a fourth doctoral-level psychologist with expertise in researching, assessing, and diagnosing ADHD in children and adults. This study utilizes ADHD status during Year 1 of college.

Adult ADHD Rating Scales (parent version, childhood version, past 6 months).—Participants provided information about ADHD symptoms prior to age 12 and over the past 6 months using the Adult ADHD Rating Scale, which was modeled after the childhood ADHD Rating Scale–IV (ADHD-IV; DuPaul, Power, Anastopoulos, & Reid, 1998). Participants completed Likert-type scales for each ADHD symptom (0 = *never*, 1 = *sometimes*, 2 = *often*, 3 = *very often*). Responses of *often* or *very often* indicated the presence of a symptom. Participants who were taking medication for ADHD completed each question twice to capture symptoms both when taking and when not taking medication. With consent of the student, parents completed a single rating scale that reported on the same student behaviors without medication both during childhood and within the past 6 months. All participants in the ADHD group exhibited (either via participant report or parent report) four or more symptoms of either hyperactivity/impulsivity or inattention both currently and prior to age 12. Participants in the comparison group had three or fewer symptoms on each respective measure.

Although the Adult ADHD Rating Scales were developed specifically for the TRAC Project, several studies have investigated the ADHD-IV for evidence of reliability and validity in other populations. In samples of children, the ADHD-IV produces internal consistency scores (α) between .86 and .96 (DuPaul, Power, McGoey, Ikeda, & Anastopoulos, 1998). Evidence for concurrent validity includes large correlations with other measures of ADHD and other measures of disruptive behavior ($r = .79$-$.81$; DuPaul, Anastopoulos, et al., 1998). The three versions of the Adult ADHD Rating Scale were assessed for internal consistency (i.e., coefficient α) for the current sample and ranged from .770 to .95.

Semi-Structured ADHD Interview.—Next, participants completed a Semi-Structured ADHD Interview, which was developed to reflect *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; APA, 2000) criteria for adult ADHD (APA, 2000) and adapted to meet the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; APA, 2013) criteria. This interview assessed for presence of the *DSM*-described ADHD symptoms via asking binary questions about each *DSM-IVTR* symptom of

ADHD. In the instance of a "yes" response, assessors followed up with unstructured questions to assess impairment. Each section ended with structured questions to determine age of onset and impairment. Consistent with the *DSM-IV-TR* definition of ADHD, all first cohort participants in the ADHD group endorsed at least six symptoms of inattention and/or hyperactivity/impulsivity, and indicated that they began prior to age 12. Individuals in the comparison group indicated fewer than six symptoms of both inattention and/or hyperactivity/impulsivity. As the *DSM-5* was released between Years 1 and 2 of the TRAC Project, inclusion criteria for the ADHD group were adjusted to include individuals with at least five symptoms for Cohort 2.

Psychiatric psychopathology.—The presence of additional psychiatric psychopathology was also determined by a fourpsychologist panel based on their review of self-report of psychological diagnoses by a participant in addition to their responses to multiple widely used and validated psychodiagnostic measures, including the Structured Clinical Interview for *DSM* Disorders–Clinician Version (SCID-CV; First, Spitzer, Gibbon, & Williams, 1996), the Beck Depression Inventory, 2nd Edition (BDI-II; Beck, Steer, & Brown, 1996), and the Beck Anxiety Inventory (BAI; Beck & Steer, 1993). The panel of psychologists determined the presence or absence of diagnoses and discussed any diagnostic disagreements until a consensus was achieved. Given the nature of the research question, the current study excluded cases of learning disability (LD) from consideration in determining the presence or absence of psychiatric psychopathology. Psychiatric status during Year 1 of college was considered for this study.

ATOD use.—Participants completed the World Health Organization's (WHO) *Alcohol, Smoking, and Substance Involvement Screening Test Version 3.0* (ASSIST; Humeniuk, Henry-Edwards, Ali, Poznyak, & Monteiro, 2010). The ASSIST is a brief structured interview in which participants indicate lifetime and recent use of a list of substances, as well as social and functional impairment associated with their use of each substance. These responses generate scores specific to each substance. Each substance-specific score ranges from 0 to 39 with the exception of tobacco, which ranges from 0 to 31. Individuals scoring between 4 and 26 are considered at "moderate risk" of health and other problems associated with continued use of a given substance, whereas those with scores above 27 are considered to be at "high risk." The criteria for "moderate risk" for alcohol are more lenient than other drugs: scores between 11 and 26 are considered "moderate risk." The scale's developers demonstrate evidence of convergent validity through moderate to large correlations with various other self-report measures, as well as discriminant validity when using the cutoff scores described previously. For the purposes of the current study, the presence or absence of ATOD risk in the year ending at their Year 2 assessment was considered.

Psychosocial and psychopharmacological services.—The Services for College Students Interview (SCSI) was developed for the purposes of the TRAC Project. This measure includes 13 questions about students' engagement and satisfaction with various services. For the purpose of the current study, participants were considered to have engaged in psychosocial treatment if they had met with a counselor or registered with disability services year prior to their second year of college, and were considered to have engaged in

psychopharmacological treatment for ADHD if they reported having taken medication for ADHD within the year prior to their second year of college. Both treatment conditions were considered as binary variables.

QoL.—The ADHD Impact Module for Adults (AIM-A, Landgraf, 2007) is a self-report measure of QoL and contains items intended to measure global QoL as well as ADHD-specific QoL within six domains relevant to ADHD. For the purposes of the current study, only the global item was used, which was completed by both groups with the comparison group receiving modified instructions for the measure. This item includes the anchors of *worst* for 1 and *best* for 10, and was selected for several reasons. First, it is indicated by the AIM-A developers to be indicative of "overall QoL." Second, whereas domains were chosen by the AIM-A developers due to ADHD impairment associated with various domain-specific outcomes, using a global measure allows for comparisons on an outcome equally relevant to both groups but not explicitly biased against adults with ADHD. Third, the global item is similar to other widely used 1 to 10 scales of QoL that generally demonstrate acceptable test–retest scores, as well as evidence of validity in the form of strong correlations with multi-item QoL assessments and outcomes relevant to QoL (Bowling, 2005; Lyubomirsky & Lepper, 1999). Participants' responses to the global item during their second year of college were examined for this study.

Procedures

Participants were recruited through several means including referrals made from university disability service offices and counseling and health centers; fliers; social media posts; university-wide announcements; peer referral; and sign-ups during orientation. All participants were more than 18 years of age and provided informed consent, and the TRAC study was approved by all nine college's or university's institutional review board (IRB). Participants met with graduate student research assistants between 1 and 3 times per year for a total of approximately 2 to 4 hr. Research assistants were trained to administer scales and interviews by doctoral-level psychologists or advanced graduate students, as well as through a video training. The scales were administered in a standard order using their standard instructions with the exception of the comparison participants completing the AIM-A. To assure that assessments happened close to 1 year apart, participants were reassessed the following year in the same semester during which they had initially been assessed (e.g., fall or spring). Participants were compensated US$100 per year for their time.

Data Analysis Procedures

To investigate Research Questions 1 and 2, two different ANOVAs were conducted. The first ANOVA used ADHD status during Year 1, psychopathology during Year 1, psychosocial treatment during Year 1, and ATOD risk during Year 1 as independent variables, and QoL during Year 2 as the independent variable. The second ANOVA included ADHD medication status as a dependent variable and QoL as a dependent variable. To address Research Question 1, the first ANOVA was inspected to determine whether there was a main effect of ADHD. To address Research Question 2, the procedure for moderation recommended by Baron and Kenny (1986) was employed in which significant interactions between ADHD and other independent variables would suggest moderation. The second ANOVA addressed

evidence for moderation as a function of ADHD medication status, and was conducted separately because no participants in the control group took ADHD medication. To reduce the potential for experimentwise Type I error, the two ANOVAs were subject to Bonferroni correction for their main and interaction effects such that *p* values below .025 were considered to be statistically significant. Finally, Research Question 3, which addressed the extent to which significant variables identified through the first two questions account for the variability in QoL, was explored through a hierarchical linear regression. Within this regression, the impact of ADHD was included at Step 1 with all other significant predictor variables added at Step 2.

Results

Research Question 1: QoL Differences as a Function of ADHD

The first analysis addressed whether there were differences in QoL in a student's second year of college as a function of whether or not they met criteria for ADHD during their first year of college.[1] To investigate this potential relationship, a four-way ANOVA was conducted as described previously. There was a significant main effect of ADHD status, $F(1, 356) = 9.453$, $p = .002$, $\eta_p^2 = .026$, $d = .32$. College students with ADHD reported lower global subjective QoL ($M = 7.08$) than college students without ADHD ($M = 7.94$). This effect is considered to be small (Cohen, 1988). There were also significant main effects of psychopathology, $F(1, 356) = 14.210$, $p < .001$, $\eta_p^2 = .038$, $d = .43$, and psychosocial treatment, $F(1, 356) = 4.392$, $p = .037$, $\eta_p^2 = .012$, $d = .23$, but not ATOD risk, $F(1, 356) = .022$, $p = .881$, $\eta_p^2 > .001$, $d = .02$. Descriptive statistics are displayed in Table 2.

Research Question 2: Potential Moderator Variables

The second research question addressed whether variables related to both ADHD and QoL among college students moderated the relationship between ADHD and QoL. To answer this question, interaction effects in the first ANOVA were considered along with the results of the second ANOVA focusing on medication. Descriptive statistics for each of the analyses can be found in Table 3.

The first ANOVA addressed whether the presence or absence of comorbid psychopathology, use of psychosocial services, and/or ATOD risk moderated the relationship between ADHD and QoL. ADHD status did not significantly interact with any of the other independent variables, including psychosocial treatment, $F(1, 356) = 0.534$, $p = .534$, $\eta_p^2 = .001$; psychopathology, $F(1, 356) = 2.179$, $p = .141$, $\eta_p^2 = .006$; and ATOD risk, $F(1, 356) = 1.338$, $p = .248$, $\eta_p^2 = .004$.

[1]Because women were more likely to persist in the study, gender was originally included as a covariate in analyses. However, this did not impact the statistical significance or direction of findings, so was dropped for parsimony.

The second ANOVA addressed the impact of ADHD medication on QoL. There was a significant main effect of ADHD/medication status, $F(2, 365) = 18.28$, $p < .001$, $\eta_p^2 = .091$. This effect is considered to be medium-sized (Cohen, 1988). A post hoc Tukey's honestly significant difference (HSD) test demonstrated that the comparison group reported QoL ($M = 7.94$) that was significantly greater than the QoL of participants with ADHD who took medication ($M = 7.19$; $d = .54$) and participants with ADHD who did not take medication ($M = 6.94$; $d = .75$). The two ADHD groups were not significantly different from one another ($p > .05$; $d = .17$).

Research Question 3: Portion of Variance Explained

The final research question addressed the total portion of QoL explained by the statistically significant factors in this study through hierarchical linear regression. The first step, which included ADHD status, significantly predicted QoL, $F(1, 370) = 34.80$, $p < .001$. This model predicted 9% of the variance in QoL ($R^2 = .09$) and the presence of ADHD accounted for a reduction in QoL of .86 units on the AIM-A, or .29 standard deviations. The second step added other significant predictors (psychopathology and psychosocial treatment) and significantly predicted QoL, $F(3, 364) = 22.16$, $p < .001$. This model predicted 15% of the variance in QoL, which is a significant improvement from the original model ($R^2 = .15$, $\Delta R^2 = .067$, $p < .001$). In this model, the relative weight of ADHD was reduced such that the presence of ADHD predicted a reduction in QoL by .47 units on the AIM-A, or –.16 standard deviations. The presence of psychosocial treatment was associated with a reduction in QoL by .33 units on the AIM-A, or .11 standard deviations, and the presence of psychopathology was associated with a reduction of .8 units or .25 standard deviations. In this model, therefore, psychiatric psychopathology has the greatest relative impact on QoL, accounting for approximately 50% of the predictive power of the model as compared with about 30% from ADHD and 20% from psychosocial treatment. See Table 4 for model summaries and Table 5 for regression coefficients.

Discussion

The primary purpose of this study was to investigate the relationship between ADHD and QoL among college students. In particular, this study sought to place this relationship in context by investigating the interrelationship between these two variables and other variables relevant to both ADHD and QoL. This is the first study to date to examine the relationship of QoL and ADHD among college students that uses a large, well-defined, longitudinal sample of college students both with and without ADHD. The findings from the present study indicated that ADHD evidenced during students' first year of college was associated with significantly lower perceptions of QoL during the second year of college. Furthermore, the findings suggested that the relationship between global subjective QoL and ADHD was not impacted at a statistically significant level by the presence or absence of comorbid psychiatric diagnoses, problematic substance use, utilization of psychosocial services as defined in this study, or the use of medication to manage ADHD symptoms.

Main Effect of ADHD on QoL

The finding that college students with ADHD report lower QoL than their peers without ADHD is consistent with prior investigations (e.g., Grenwald-Mayes, 2001; Gudjonsson et al., 2009), but builds on these studies in two ways. First, the current study is more methodologically rigorous. Whereas Grenwald-Mayes used a small, clinical sample and Gudjunsson and colleagues used a community sample with few or no cases of ADHD, the current study used a multimethod longitudinal assessment to generate and assess a large sample of students with and without ADHD. Second, whereas Grenwald-Mayes found mostly null results and Gudjunsson and colleagues found results primarily in a sample of students without ADHD, the current study is able to make conclusive categorical comparisons between students with and without ADHD.

Compared with academic outcomes, psychosocial outcomes of college students with ADHD are relatively understudied (DuPaul et al., 2009; Weyandt & DuPaul, 2006, 2008). The current study expands on this body of literature in finding that college students with ADHD exhibit a similar pattern of QoL as their noncollegiate adult peers (Agarwal et al., 2012). Previous researchers (see Green & Rabiner, 2012) have articulated theories in which college students with ADHD, by virtue of their ability to gain admittance to college, would be resilient to impairment that is observed in the general population of adults with ADHD. The current study does not support this theory with regard to QoL as an indicator of psychosocial functioning. Although this study cannot conclude whether the impairment found in the current sample is comparable in *magnitude* to that which is observed in the general adult population, college students with ADHD exhibit a similar *pattern* of impairment to their noncollegiate peers with regard to QoL. That is, although it is possible that membership in a selective college community makes their deficits relatively smaller, this study indicates that subjectively interpreted QoL deficits observed in the general population of adults with ADHD are also observed in college populations (Agarwal et al., 2012).

Moderation of the ADHD/QoL Relationship

It was hypothesized that the negative impact of ADHD on QoL would be lessened in the presence of psychosocial and/ or psychopharmacological treatment and exacerbated in the presence of comorbid psychopathology or problematic use of ATOD. However, no statistically significant evidence for these hypothesized moderation effects was found.

There was a significant main effect of comorbid psychiatric diagnoses observed, and this variable was the most powerful predictor of QoL observed in the study. However, this variable appears to impact QoL independently of ADHD, as it did not significantly interact with ADHD status. Although the present study failed to find a moderating relationship, the finding that psychiatric symptoms contribute to a reduction in QoL above and beyond that of ADHD is consistent with the findings of other literature (Brod et al., 2006; Gudjonsson et al., 2009).

Also contrary to hypotheses, ATOD use and utilization of psychopharmacological or psychosocial interventions did not moderate the relationship between ADHD and QoL. One possible explanation for the lack of findings pertaining to ATOD use relates to the nature of

the WHO ASSIST, which combines both frequency of and problems associated with use to determine an individual's risk. Given that previous research (Murphy et al., 2006; Murphy, McDevittMurphy, & Barnett, 2005) has emphasized the importance of ATOD problems over frequency in predicting QoL, this measure may overestimate individuals who are at risk for ATOD problems for the purposes of the current study. The finding that medication use was not related to improvements in QoL among college students with ADHD differs from those of previous research with children and adults, which has generally found medication use to be associated with gains in QoL (Coghill, 2010). One possible reason for these findings is that, unlike many previous studies, this study used global subjective QoL (rather than domain-specific QoL, such as health-related or school-related QoL) as an outcome of interest. As such, it is possible that individuals who take medication to manage their ADHD symptoms observe narrow effects, but that these effects do not generalize to broader evaluations of their life. Finally, the lack of significant findings relative to psychosocial treatment is notable. However, these findings are tempered by limitations through the broad way in which psychosocial services were defined in this study. Research investigating the efficacy of psychosocial treatment for college students with ADHD is in its early stages (e.g., Anastopoulos & King, 2015; Canu & Wymbs, 2015; LaCount et al., 2015), and the current study highlights the continued need for ongoing research. For practitioners, advising clients as to the outcomes they should expect may help objective benefits (e.g., improved study skills) generalize to global subjective QoL, and the findings of this study highlight the utility that global subjective QoL might have in monitoring the outcomes of treatment.

Finally, the current study investigated the extent to which the variables identified as being associated with QoL explain the total variability in QoL among college students. The model that included ADHD status, psychosocial treatment, and comorbid psychopathology accounted for approximately 15% of the variability in QoL. Furthermore, both factors uniquely contribute to QoL, with psychiatric psychopathology most powerfully influencing QoL (see Table 5). The added predictive power of including psychopathology in the model highlights the importance of future research continuing to investigate related variables to account for the unexplained 85% of the variance.

Limitations and Implications

Although the current study features several methodological strengths such as a longitudinal design and a large, welldefined sample of college students drawn from the community, there are several limitations to note. First, the current study used a very broad definition of psychosocial service receipt. As such, it is unable to provide information as to whether dosage or type of service received served to moderate the relationship between ADHD and QoL. Second, because the current study did not control for ADHD severity in its analyses (as this was essentially the only quality differentiating the ADHD alone groups from the comparison group), it is possible that the students who used medication were also those with the most impairment, such that medication reduced what would otherwise be a gap between these student and unmedicated students. Finally, the AIM-A was designed for use exclusively by adults with ADHD. Although in isolation the global QoL item used in these specific analyses is similar to other global measures of QoL, the tool was not validated for adults without ADHD.

The current study has several implications for research and practice. The findings demonstrate that a single-item measure of global subjective QoL, which takes seconds to administer, is sensitive to differences in numerous factors present a year ago. Future studies should investigate the potential utility of such a measure in treatment-related settings, including informing treatment-related decisions and monitoring the progress of intervention. The study highlights the need for clinicians working with college students with ADHD to routine assess for the presence of other disorders, as these are common and have a potent impact on their QoL. Finally, although medication for ADHD has been shown to lead to domain-specific improvements in QoL and academic gains (Coghill, 2010; DuPaul et al., 2012), the current study found that it was not associated with global improvements in perceived QoL. Insofar as perceptions of QoL may drive treatment adherence, professionals prescribing medication should coach college students to understand what sorts of improvements in QoL to expect to help facilitate the generalization of these improvements.

Conclusion

This study adds to the limited but increasingly important body of research investigating college students with ADHD. The results of the current study provide evidence of the subjective impact of ADHD on college students. ADHD explains a significant portion of the QoL of college students and operates independently of other behaviors or qualities associated with ADHD. The extent to which college students with ADHD are distinguished as a function of their QoL has implications for service providers and policy makers on college campuses who seek to best serve their students.

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Author Biographies

Trevor D. Pinho, PhD, is the school psychologist for WhitehallCoplay Middle School in Whitehall, PA. His research and applied interests include mental health and substance use prevention and intervention among adolescents and transition-age adults. This study is the published form of his dissertation to meet graduation requirements from Lehigh University’s school psychology program.

Patricia H. Manz, PhD, is an associate professor of school psychology at Lehigh University. She has formulated an applied research program focused on promoting development and health among young children who experience socioeconomic disadvantage. His research is contextually focused, seeking to strengthen both early intervention services and parents’ involvement with their children as the means for supporting children’s development.

George J. DuPaul, PhD, is professor of school psychology at Lehigh University (Bethlehem, PA). His current research interests include early intervention for young children with ADHD, schoolbased treatment for children and adolescents with ADHD and related disorders, and assessment and treatment of college students with ADHD.

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 a campusbased ADHD Clinic. His research interests include the assessment and treatment of ADHD and its associated features across the life span, with a current focus on individuals with ADHD transitioning through emerging adulthood.

Lisa L. Weyandt, PhD, is a full professor of psychology at the University of Rhode Island (URI) and is an active member of Interdisciplinary Neuroscience Program at URI. In addition to serving as a CoPI on the Trajectories Related to ADHD in College (TRAC) study, she conducts research concerning pharmacological treatment of ADHD, prescription stimulant misuse, executive functions, and clinical neuroscience.

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Table 1.

Demographic Characteristics of the Participant Sample.

	Combined sample *N* = 372	**ADHD *N* = 171**	**Comparison *N* = 201**
Gender (%)			
Female	201 (54.0)	94 (55.0)	107 (53.2)
Male	171 (46.0)	77 (45.0)	94 (46.8)
Ethnicity (%)			
Hispanic/Latino	41 (11.0)	20 (11.8)	21 (10.4)
Non-Hispanic/Latino	331 (89.0)	151 (88.3)	180 (89.6)
Race (%)			
Caucasian	266 (71.5)	133 (77.8)	133 (66.2)
African American	46 (12.4)	18 (10.5)	28 (13.9)
Asian	22 (5.9)	5 (2.9)	17 (8.5)
More than one race	13 (3.5)	7 (4.1)	6 (3.0)
Other/not reported	25 (6.7)	8 (4.7)	17 (8.5)
Year 1 age (M, SD)	18.22, 0.510	18.24, 0.549	18.21, 0.476

Table 2.

Means and Standard Deviations for Independent Variables.

	Variable absent *M (SD)*	**Variable present *M (SD)***
ADHD	7.94 * (1.29)	7.08 * (1.50)
Psychopathology	7.86 * (1.23)	6.80 * (1.64)
Psychosocial treatment	7.74 * (1.62)	7.14 * (1.32)
ATOD risk	7.68 (1.43)	7.33 (1.47)

Note. ATOD = alcohol, tobacco, and other drugs.

* Main effect, $p < .05$.

Table 3.

Means and Standard Deviations for Moderator Variables.

Potential moderator	ADHD status	Moderator absent (*N*)	Moderator present (*N*)
Psychopathology	ADHD	7.59, 1.15 (83)	6.59, 1.62 (88)
	Comparison	7.99, 1.25 (176)	7.52, 1.53 (25)
ATOD risk	ADHD	7.17, 1.47 (87)	6.98, 1.53 (84)
	Comparison	8.00, 1.30 (135)	7.79, 1.27 (66)
Psychosocial treatment	ADHD	7.20, 1.31 (89)	6.94, 1.68 (82)
	Comparison	8.04, 1.23 (158)	7.51, 1.44 (43)
Medication	ADHD	6.94, 1.39 (77)	7.19, 1.58 (94)
	Comparison	—	7.94, 1.30 (197)

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Table 4.

Model Summaries for Regression.

	R	R^2	*SE*	ΔR^2	*p* change
Model 1: ADHD status	.296	.087	1.39	.087	<.001
Model 2: Added psychopathology and psychosocial treatment	.393	.154	1.35	.067	<.001

Table 5.

Regression Coefficients.

	Model 1		Model 2	
	b	β	*b*	B
ADHD status	−.863**	−.296**	−.466**	−.160**
Psychopathology			−.795**	−.252**
Psychosocial treatment			−.334*	−.109*

*$p < .05$.

**$p < .001$.