An RCT of a CBT Intervention for Emerging Adults with ADHD Attending College: Functional Outcomes

By: Laura D. Eddy, Arthur D. Anastopoulos, Melissa R. Dvorsky, Paul J. Silvia, Jeffrey D. Labban & Joshua M. Langberg

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Abstract:

Objective: The current study reports functional outcomes from a multi-site randomized trial of a cognitive-behavioral treatment program for college students diagnosed with ADHD. **Methods**: A sample of emerging adults ($N = 250$; ages 18 to 30) currently attending college were comprehensively evaluated and diagnosed with ADHD (*M age* = 19.7; 66% female, 6.8% Latino, 66.3% Caucasian). Participants were randomized to either a two-semester intervention (Accessing Campus Connections and Empowering Student Success (ACCESS)) or a delayed treatment condition. Participants were assessed with measures of academic, daily life, and relationship functioning prior to treatment, at the end of the first semester, and after the second semester of treatment. **Results**: Multi-group latent growth curve models revealed moderate effect size improvements on self-report measures of study skills and strategies, as well as on self-report measures of time management, daily functioning, and overall well-being for participants in ACCESS. Importantly, treatment effects were maintained or increased in some cases from the end of the first semester to the end of the second semester. Improvements in self-reported interpersonal functioning were not significantly different across condition and neither condition demonstrated significant change over time in educational record outcomes (GPA and number of credits earned). **Conclusions**: ACCESS appears to promote improvements in self-reported general well-being and functioning, time management, and study skills and strategies. However, improvements in interpersonal relationships and objective academic outcomes such as GPA were not observed. Clinical implications and future directions for treating ADHD on university and college campuses are discussed.

Keywords: ADHD | college students | cognitive-behavioral treatment | Accessing Campus Connections and Empowering Student Success (ACCESS)

Article:

Attention-deficit/hyperactivity disorder (ADHD) is a neurobiological disorder, which first presents in childhood and is characterized by symptoms of inattention and/or hyperactivity/impulsivity (American Psychiatric Association, 2013). Common behaviors reflecting inattention and hyperactivity/impulsivity include forgetfulness, trouble sustaining attention, and difficulties with organization as well as fidgeting, talking excessively, and interrupting others. Although once believed to be a childhood-limited disorder, it is now clear symptoms and impairment persist into adulthood in the majority of cases (Biederman et al., 2010).

Prevalence estimates suggest 5 to 8% of young adults attending college report a diagnosis of ADHD (Kwak et al., 2015; Wolf et al., 2009). Due to the context and demands of a university setting, this group is at risk for numerous impairments. Young adults attending college must manage course schedules, attend classes on time, and keep track of multiple deadlines and assignments without parental support. Simultaneously, they are navigating responsibilities outside of school, including independently managing daily life tasks (e.g., managing a budget, daily chores) and forming and maintaining interpersonal relationships. These tasks are particularly challenging for young adults with ADHD who commonly experience difficulties with executive function and self-regulation, which interfere with the capacity to plan, organize, monitor, and adjust their behavior compared to their peers without ADHD (Dvorsky & Langberg, 2019). As a result of these challenges, young adults with ADHD attending college report difficulties in a number of domains, including academics, daily life behaviors, and interpersonal relationships.

Academic Functioning

Effective independent management of academic work requires substantial planning (e.g., planning to complete work in time to meet deadlines), organization (e.g., prioritizing assignments according to deadlines/importance), and self-monitoring (e.g., maintaining attention while reading and studying). College students with a diagnosis of ADHD are significantly more likely than peers to experience academic challenges, such as trouble finishing timed tests, rereading material multiple times before comprehending, and taking longer to complete assignments than peers (Lewandowski et al., 2008). Additionally, young adults with ADHD attending college may lack or insufficiently use academic skills, such as effective notetaking, test-taking strategies, and identifying main ideas when reading (Reaser et al., 2007). This is concerning, because evidence indicates study skills mediate the relationship between ADHD status and GPA among first-year college students (Gormley et al., 2016). Indeed, college students with ADHD often have lower GPAs (DuPaul et al., 2018) and attempt and earn fewer credits per semester (DuPaul et al., 2018) in comparison to their non-ADHD peers.

Daily Life Performance

In addition to struggles with academic performance, young adults with ADHD attending college report a lower quality of life than their peers (Pinho et al., 2019). This may be partially explained

by struggles with daily life behaviors (e.g., financial management, health-related behaviors). For example, higher levels of ADHD symptoms are significantly associated with problematic financial behavior (e.g., compulsive spending) among college students (Graziano et al., 2015). Further, college students diagnosed with ADHD are more likely to report risky sexual health behaviors (Huggins et al., 2015). In addition, this population is more likely than peers to meet criteria for comorbid depression or anxiety disorders (Anastopoulos et al., 2018a), and engage in dangerous or problematic patterns of substance use (Rooney et al., 2012), all of which can contribute to difficulties fulfilling daily life responsibilities.

Interpersonal Relationships

Young adults with ADHD attending college may also experience more difficulties with the management of interpersonal relationships relative to their peers. For instance, ADHD symptoms are associated with challenges handling interpersonal conflict (McKee, 2017) and with poor social skills and relationship quality in comparison to peers (Bruner et al., 2015). Of even greater concern, higher levels of ADHD symptoms are associated with risk for both perpetrating interpersonal violence and experiencing interpersonal violence among college students (Wymbs et al., 2017). These struggles with interpersonal relationships may be attributed to both core symptoms of ADHD (e.g., impulsivity), in addition to higher rates of substance use (Egan et al., 2017) and emotion regulation deficits, which are both associated with interpersonal problems in young adults (Langberg et al., 2015; Surman et al., 2013).

Treatment of ADHD in Young Adults Attending College

Potential treatments to address ADHD in a college setting include medication, psychosocial approaches, and academic accommodations (e.g., extended time on tests, testing in a distraction-reduced environment). Pharmacological medication to treat ADHD is considered an evidence-based treatment based on a large body of clinical trials conducted primarily in child populations (Barkley, 2015). Evidence suggests medication is also beneficial for treating ADHD in adults (Prince et al., 2015) and college students (DuPaul et al., 2012). However, many adolescents and adults with ADHD experience significant ongoing impairment, even when taking ADHD medication (Advokat et al., 2011) and others choose to forego medication due to side effects or cost (Prince et al., 2015). In addition, although academic accommodations are commonly offered by university support services, there is limited evidence of their efficacy (e.g., Miller et al., 2015). Accordingly, the development of effective psychosocial interventions to treat college students with ADHD is imperative.

A small but growing number of studies provide data on the use of psychosocial interventions to treat ADHD in college students (see He & Antshel, 2017 for a review). One line of research has investigated a coaching approach, utilizing goal setting, organization, and time management (N = 160, Field et al., 2013; N = 148; Prevatt & Yelland, 2015). Other research groups have tested cognitive-behavioral therapy (N = 4, Eddy et al., 2015; N = 58; Van der Oord et al., 2020), dialectical behavior therapy (DBT, N = 33, Fleming et al., 2015), mindfulness-based cognitive therapy (N = 54; Gu et al., 2018), self-monitoring (N = 41, Scheithauer & Kelley, 2017), and organization, time management, and planning (OTMP) skills training (N = 17 LaCount et al., 2015; N = 37, 2018). In addition to the encouraging results with college student samples

reported above, there is strong evidence for the use of cognitive-behavioral treatment to address symptoms and impairment associated with ADHD in the general adult population (Knouse et al., 2017; Safren et al., 2005, 2010).

Taken together, results of these studies suggest psychosocial treatments may be beneficial in reducing self-reported symptoms of inattention and self-reported OTMP deficits among young adults with ADHD attending college. However, there are significant limitations to the current literature using college student samples. First, only two studies have enrolled large samples, and one of those studies ($N = 148$; Prevatt & Yelland, 2015) did not include a control group or randomization to treatment condition, limiting the ability to draw conclusions about treatment efficacy. The remaining larger study ($N = 160$, Field et al., 2013) did not implement a structured treatment protocol or conduct a comprehensive ADHD assessment. Studies that have included structured treatment protocols, randomization to condition, and a comprehensive assessment of ADHD had small sample sizes ($N = 4$ to $N = 58$), limiting generalizability of the results. Finally, the studies described above measured outcomes primarily in terms of self-reported ADHD symptoms and executive functions. Few studies have assessed the impact of treatment on functioning. In the studies which did report such outcomes, results were inconsistent. For instance, Fleming et al. (2015) and Prevatt and Yelland (2015) reported significant improvements on broad measures of quality of life (via self-report). However, Prevatt and Yelland (2015) reported nonsignificant change on self-reported interpersonal impairment. As noted previously, young adults with ADHD attending college can experience impairment in a multitude of areas, including academics, social relationships, and daily life. Therefore, it is important to fully assess the impact of interventions on multiple aspects of impairment.

The *Accessing Campus Connections and Empowering Student Success (ACCESS)* intervention is a cognitive-behavioral treatment program delivered over two academic semesters designed to address ADHD and associated impairments in emerging adults with ADHD attending college. During the first semester (designated the "active phase") students participate in an eight-week group focused on presenting/teaching psychoeducational knowledge about ADHD, behavioral strategies, and adaptive thinking skills. Students also receive up to 10 weekly individual "mentoring" sessions with a focus on helping students implement knowledge, strategies, and skills learned in the group sessions. Treatment in the second academic semester (designated the "maintenance" phase) includes one group session and weekly individual mentoring for four to six sessions, which provides a gradual decrease in program support.

ACCESS was developed systematically, beginning with a pilot test of the protocol, subsequent modification, and testing in an open clinical trial (see Anastopoulos & King, 2015 for details; Anastopoulos et al., 2018b). Participation in ACCESS was associated with significant improvements in ADHD symptoms, executive functioning, and depression and anxiety after one semester and at follow-up assessments (5 to 7 months after treatment initiation; Anastopoulos & King, 2015; Anastopoulos et al., 2018b). Based on these results, a large, multisite randomized controlled trial (RCT) was conducted. Importantly, ACCESS was designed to target both key symptoms of ADHD as well as functional impairment commonly associated with ADHD (e.g., difficulties with academic performance, difficulties with daily life activities, and interpersonal relationships). Accordingly, a detailed examination of outcomes in both areas (symptoms and functional impairment) is essential to evaluating the efficacy of this treatment. The current study

focuses on treatment-related change in functional impairment: specifically, academic outcomes (learning and study strategies and educational record data), daily life activities, and interpersonal functioning. The effects of ACCESS on ADHD symptoms, executive functioning deficits, and comorbid symptoms of depression and anxiety are reported in a prior manuscript (Anastopoulos et al., 2021). We expected ACCESS to be more effective than the control condition on improving learning and study strategies, GPAs, interpersonal functioning, and overall daily functioning and well-being.

Method

Participants

Participants were recruited at two large, public universities in urban areas of the southeastern United States that serve large numbers of first-generation college students and students of color. See "Procedure" section below for more details on student recruitment. A total of 361 students completed informed consent procedures and were screened for eligibility. Eighty-one participants were deemed ineligible. Most did not meet full criteria for ADHD; a smaller percentage were diagnosed with an active psychiatric condition with the potential to require treatment beyond the scope of the intervention (e.g., autism spectrum disorders, bipolar disorder). Some eligible students ($N = 30$) randomly assigned to the immediate ACCESS group could not participate due to scheduling conflicts preventing attendance at group sessions. Thus, the final sample included 250 participants ranging in age from 18 to 30 years ($M = 19.68$; $SD = 2.15$). The progression of participants through the study is depicted in Figure 1. The majority of the sample identified as female ($N = 165$; 66%) and slightly less than half identified as first-year freshmen (i.e., 47.6% first-year students, 16.4% sophomores, 26.4% juniors, 9.6% seniors). Approximately 6.8% of the participants identified as Hispanic/Latino; 66.3% identified as Caucasian, 14.2% as African American, 5.3% as Asian, 0.4% as Native American, 10.6% as multi-racial, and 3.3% as other.

A multi-method, multi-informant assessment was used to determine ADHD and comorbidity status. Final determination of ADHD eligibility status was made by a panel of three licensed clinical psychologists with ADHD expertise who reviewed evaluation data (described below) and other relevant background information (e.g., school history, prior ADHD diagnosis and treatment) and whose unanimous agreement was required. All participants underwent a comprehensive evaluation procedure designed to assess for a diagnosis of ADHD as defined in the *Diagnostic and Statistical Manual of Mental Disorders – Fifth Edition (DSM-5; APA, 2013).*

Participants were administered a semi-structured interview collecting information about ADHD symptoms and impairment associated with symptoms. Further, parent-report of childhood symptoms of ADHD (i.e., symptoms present prior to age 12) was collected by telephone interview. Finally, evaluation procedures included a structured interview assessing for the presence of other psychiatric conditions; further, information about onset and duration of psychiatric conditions was collected to inform differential diagnosis between ADHD and other conditions. Background information (e.g., history of ADHD diagnosis, past academic/social functioning) was also collected. Participants were diagnosed with ADHD if the panel determined they met DSM-5 criteria for ADHD as evidenced by 5 or more symptoms of inattention and/or

hyperactivity/impulsivity, impairment associated with symptoms, the presence of developmentally inappropriate symptoms prior to age 12, and symptoms and impairment not better explained by another ongoing psychiatric condition. In the final sample (N = 250), 58.4% met criteria for an ADHD Combined presentation and 41.6% for ADHD Predominantly Inattentive presentation. Notably, 90.8% had either been previously diagnosed with (66.4%) or strongly suspected of having ADHD (24.4%). Furthermore, 60% of participants met DSM-5 criteria for at least one co-occurring psychiatric diagnosis (i.e., 29.6% met criteria for a depressive disorder and 31.6% met criteria for an anxiety disorder).

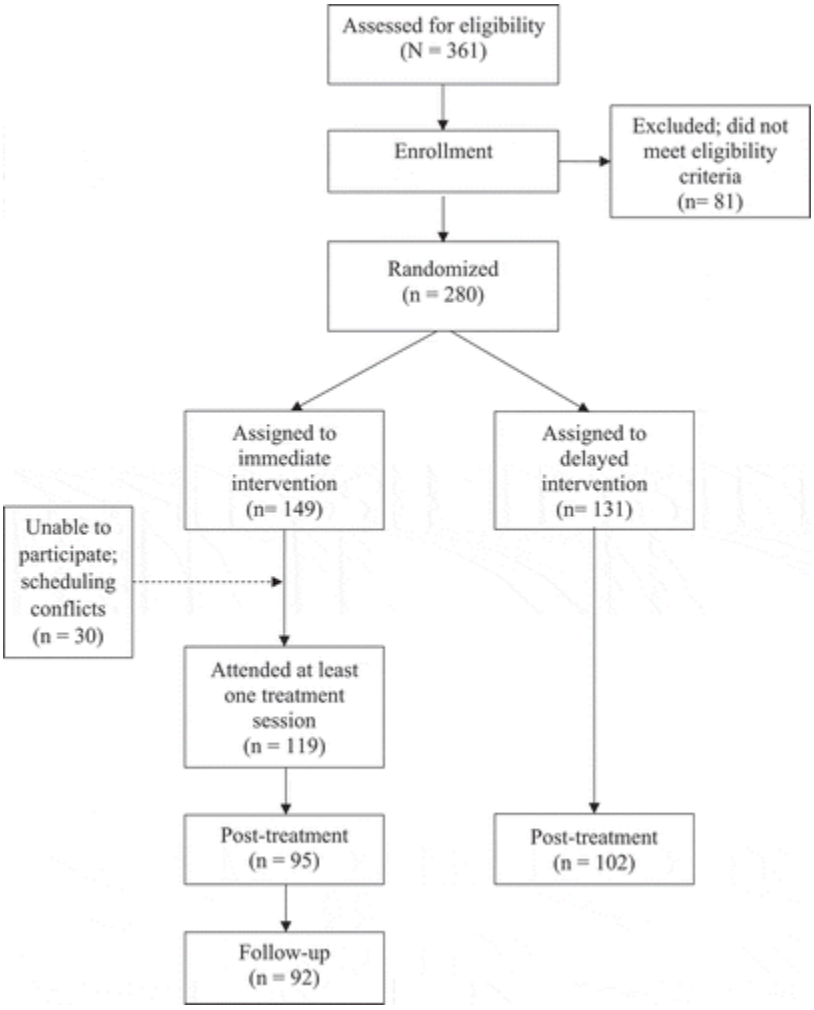

Figure 1. CONSORT diagram showing flow of participants through clinical trial

For clinical and ethical reasons, participants were not prohibited from other forms of treatment (e.g., use of medication to treat ADHD); treatment use was monitored throughout the study. The final sample consisted of 119 immediate ACCESS participants and 131 delayed treatment control (DTC) participants. DTC participants received ACCESS after two semesters. As shown in Table 1, the two groups were statistically equivalent at pre-treatment across numerous demographic and clinical variables.

Table 1. Pretreatment demographic and selected clinical characteristics by group

	ACCESS (N = 119)	DTC (N = 131)	Total (N = 250)
Variable	***M* (*SD*)**	***M* (*SD*)**	***M* (*SD*)**
Age	19.74 (2.24)	19.63 (2.07)	19.68 (2.15)
FSIQ	110.53 (10.72)	110.56 (12.34)	110.54 (11.57)
CAARS Total Score	34.43 (9.25)	34.73 (8.86)	34.59 (9.03)
	(%)	*(%)*	*(%)*
Female	64.7%	67.2%	66%
Race Caucasian	66.1%	66.4%	66.3%
Black/African American	11.9%	16.4%	14.2%
Asian	5.1%	5.5%	5.3%
More than one race	11.9%	9.4%	10.6%
Other/not reported	5.1%	2.4%	3.7%
Ethnicity/Hispanic	7.0%	6.6%	6.8%
First Year College Students	49.6%	45.8%	47.6%
Comorbidity Status	62.2%	58.0%	60%
Predominantly Inattentive Presentation	41.2%	42.0%	41.6%
Combined ADHD Presentation	58.8%	58.0%	58.4%
ADHD Medications	52.9%	41.9%	47.2%
Other Medications	26.1%	29.0%	27.6%

DTC = Delayed Treatment Condition; no statistically significant group differences detected using χ^2 for categorical variables and *t*-tests for dimensional variables; CAARS Total Score = overall ADHD symptom severity; Comorbidity Status = presence of other DSM-5 mental health disorders co-occurring with ADHD; CAARS Total Score is reported in raw score form. ADHD Medication Status = reported use of medication to treat ADHD; Other Medication Status = reported use of a medication to treat other medical/mental health conditions.

Treatment Program

ACCESS incorporates elements of empirically supported adult CBT programs (Safren et al., 2005; Solanto, 2011), adapted to the developmental needs of emerging adults with ADHD in college and delivered in two consecutive semesters. Treatment consists of both group and individual mentoring meetings. The first semester (active phase) includes eight weekly group sessions (90 minutes each). Concurrently, weekly individual mentoring sessions (30 minutes each) are conducted. In the second semester (maintenance phase), treatment is faded (see below).

Groups included four to six students on average. A discussion-based format was used to actively engage group members, and handouts summarizing content were provided. Guest speakers from campus support services (e.g., disability services, student health) met with groups to present information and answer questions about services. During active phase mentoring sessions, participants worked individually with an assigned mentor to support their implementation of treatment strategies and techniques. Mentors also encouraged connections with resources as needed (e.g., disability services). During the maintenance phase, a single 90-min group session was conducted, along with up to six 30-min individual mentoring sessions scheduled through the semester at times best meeting participant needs. Attendance data provides evidence for treatment acceptability: 83.2% of the immediate treatment group attended at least 6 group sessions, and 85.7% attended a majority of mentoring sessions.

The overall goal of the ACCESS program is to give college students with ADHD the knowledge and skills necessary to be successful in their daily life functioning by increasing knowledge of ADHD; improving behavioral skills addressing executive functioning deficits; and increasing

adaptive thinking skills. Thus, ADHD knowledge, behavioral strategies, and adaptive thinking skills are conceptualized as clinical change mechanisms.

Diagnostic Measures

Consistent with best-practice recommendations (Ramsay, 2015), a multi-method, multi-informant comprehensive assessment was used to determine ADHD diagnostic status.

Semi-Structured Interview for Adult ADHD

The Semi-Structured Interview for Adult ADHD was developed for this study to allow a more thorough assessment of ADHD-specific impairment. For each ADHD symptom (18 total) respondents rate frequency of occurrence and degree of associated impairment. Additional questions assess other DSM-5 criteria (impairment, duration, age of onset). Analyses from the current study indicate this interview possesses adequate internal consistency (from .84 to .90) and is highly correlated with Conners Adult ADHD Rating Scale (Conners et al., 2006) symptom dimensions (from .78 to .84). Information obtained from this interview was used in combination with other assessment data to determine ADHD diagnostic status.

ADHD Rating Scale-5

The ADHD Rating Scale-5 (ARS-5; DuPaul et al., 2016) is a widely-used 18-item questionnaire assessing current symptoms of ADHD with strong psychometric properties. The self-report and parent-report versions of the ARS-5 were modified to include a rating for symptoms in childhood. These self-report and parent ratings were used to provide an estimation of the onset and persistence of ADHD across the life span.

Structured Clinical Interview for DSM-5: Research Version

The Structured Clinical Interview for DSM-5: Research Version (SCID-5-RV; First et al., 2015) is a semi-structured interview designed to assess a range of DSM-5 psychiatric disorders in a research context. Screeners for the mood, anxiety, trauma, and substance use modules were initially conducted, and complete modules were administered if indicated by screening responses. Information from this measure was used to determine the presence of ADHD exclusionary conditions and/or comorbidity status.

Outcome Measures

Learning and Study Strategies Inventory – Second Edition

The Learning and Study Strategies Inventory – Second Edition[1] (LASSI-2; Weinstein et al., 2002) is a self-report measure designed to assess the academic skills and strategies of college students, in addition to attitudes and beliefs associated with academic success. The LASSI-2 was developed and normed using a large, nationally representative college student population. It includes 80 items rated on a 5-point Likert-style scale to indicate the frequency of each behavior. The present study included the Motivation ($\alpha = .79$), Time Management ($\alpha = .75$), Test Strategies

(α = .73), and Study Aids (α = .70) scales. Higher scores on Study Aids, Test Strategies, and Time Management indicate more frequent use of these skills. Higher scores on the Motivation scales indicate more willingness to exert effort to complete academic goals (Weinstein et al., 2002). Evidence for adequate levels of reliability has been reported for these scales (α's ranging from .62 to .85; Cano, 2006; Weinstein et al., 2002). Independent studies have reported scores on the LASSI-2 are significantly and positively correlated with academic performance (i.e., grades, GPA, standardized test scores; Marrs et al., 2009).

Educational Record Data

Educational record data were obtained from the university registrar office at each site. Specifically, these data included participants' semester grade point averages (GPA) ranging from 0.0 to 4.0 and the number of credits attempted per semester.

ADHD Impact Module-Adult

The ADHD Impact Module-Adult (AIM-A; HealthAct CHQ Inc, 2007) is a self-report measure designed to assess the effects of ADHD symptoms and associated impairments on a number of life domains. Scales include Living with ADHD, General Well-Being, Performance and Daily Functioning, Relationships and Communication, Bothersomeness and Concern, and Daily Interference.

Scores range from 0 to 100 with higher scores representing higher functioning. The AIM-A has demonstrated good internal consistency (α's > .80) and concurrent and discriminant validity (Landgraf, 2007). The Performance and Daily Functioning (α = .84), Relationships and Communication (α = .78), and General Well-Being (α = .88) scales were utilized in this study. The Performance and Daily Functioning scale (11 items) measures self-perceptions of performance in managing daily responsibilities and engaging in general problem-solving and decision making. Participants rate their adeptness at "handling everyday hassles," and "ability to adapt to disruptions or unexpected changes in routine." For the General Well-Being scale (10 items), respondents are asked to rate frequency of positive mood states, such as "accepting of yourself" and "able to cope." The Relationships and Communication Scale (eight items) measures self-perceived interpersonal skill. Respondents rate their ability to engage in behaviors such as "reading others' emotions and non-verbal cues" and "resolving interpersonal conflicts."

Procedure

Students were recruited from multiple sources, including various campus support units (e.g., disability services, student health services), first-year summer orientation sessions, and campus fliers. E-Mail advertisements announcing the study were sent to students currently registered with disability services at each respective campus. At orientation sessions, information was posted in a visible location and research staff were available to answer questions. Students who expressed interest were encouraged to contact study personnel; their name and phone number were also collected to facilitate contact. Interested students were screened by study staff, who read symptom descriptions from the ADHD Rating Scale-5 aloud via the phone. Students who endorsed 4 or more symptoms of either inattention and/or hyperactivity/impulsivity were

scheduled for a longer, more comprehensive evaluation. At this evaluation, information pertinent to determining eligibility was collected as well as pretreatment outcome data.

Participants meeting eligibility criteria were randomly assigned to receive ACCESS immediately or after a one-year delay (i.e., DTC group). Random assignment was stratified by medication status to ensure equivalent numbers of participants taking ADHD medication in each group. Recruitment was ongoing, and ACCESS was delivered to five successive cohorts of participants across consecutive semesters from the fall of 2015 through the spring of 2018. Treatment outcome data were collected from both groups prior to beginning treatment, after the first semester of treatment, and in the final weeks of the second semester.

Graduate student research assistants and one licensed master's level professional counselor served as group leaders and mentors. All received extensive training (e.g., assigned readings, group discussions, observations, and role playing) to prepare them to implement the treatment protocol with fidelity. To promote treatment fidelity throughout the study, weekly supervision was provided by licensed doctoral-level clinical psychologists experienced in the treatment protocol; in addition, a detailed treatment manual was provided to group leaders and mentors. Treatment sessions were recorded, and 20% were randomly selected and reviewed for fidelity by supervisors. Supervisors used a treatment fidelity checklist listing relevant session content in their review and marked each content item as "addressed" or "not addressed." These ratings were used to calculate an adherence percentage for each session (items addressed per total number of content items). Overall adherence was excellent, as indicated by fidelity ratings of 96.4% and 95.6% for reviewed group and mentoring sessions, respectively.

Multiple steps were taken to encourage attendance and continued participation. First, participants received multiple reminders about group and mentoring sessions via e-mail and text message, which were sent the day of sessions and 1 hour prior to sessions. Second, participants were allowed to reschedule individual mentoring sessions, and to participate in group "makeup" sessions after missing a group session. Third, participants were compensated for completing outcome measures; compensation was slightly higher for post-maintenance measure completion to encourage continued participation. Rates of attrition at post-maintenance did not differ significantly across condition (20.2% and 22.1% for immediate treatment and control conditions, respectively). A comparison of those who did and did not complete treatment revealed non-significant differences on pretreatment demographics and clinical characteristics (e.g., symptoms of ADHD, executive functioning, depression, or anxiety).

All study procedures were approved annually by each university's Institutional Review Board. In addition to receiving monetary compensation for completing screening ($70) and outcome measures ($25 to 50 USD), participants were given a written evaluation summary, which could be used as required documentation for campus support services (e.g., disability accommodations, medication).

Analytic Plan

To evaluate change over time, we estimated multiple-groups latent growth curve models. These models estimate change over time separately for each group (immediate ACCESS versus delayed

treatment condition). As in our prior work (Anastopoulos et al., 2021), latent intercept and slope factors were specified using the observed scores for the pre-active treatment, post-active treatment, and post-maintenance time points as indicators. For the intercept, the three indicators' loadings were fixed to 1 (i.e., 1/1/1). For the slope, the first indicator (pre-active) was fixed to zero, the second indicator (post-active) was freely estimated, and the final indicator (post-maintenance) was fixed to 1 (i.e., 0/*/1). In this specification the model intercept value reflects initial status at pre-active treatment and the model slope value reflects *total change* from pre-active treatment (Time 1, coded 0) to the post-maintenance (Time 3, coded 1) time point. The intercept and slope were allowed to covary. The models were estimated in Mplus 8.1 using maximum likelihood estimation with robust standard errors.

Differential change over time was evaluated via a multiple-groups framework. By specifying the immediate ACCESS and DTC conditions as groups and constraining their slopes to be equal, Wald tests can evaluate if slopes significantly differed between treatment conditions. A significant Wald test indicates a rejection of the null hypothesis of equal slopes in the two group conditions. Within each group, the residual variances of the intercept and slope, as well as their residual covariance, were freely estimated. The three indicators' residual variances were constrained to be equal within each group to model homoscedasticity (Preacher et al., 2008). The residual variances of the slopes tended to be small and were fixed to 0 in a couple cases (i.e., for LASSI-2 Test Strategies and AIM-A relationships) to facilitate model convergence. Consistent with random assignment to condition, there were no significant effects of treatment condition on the intercepts (i.e., Time 1 scores), so those are omitted. Further, analyses indicated nonsignificant differences between groups in terms of demographic variables[2] such as age, gender, race, and year in school (consistent with random assignment to condition). Similarly, initial growth analyses indicated that site had a nonsignificant effect on growth trajectories, accordingly, this variable was not included in the final model for the sake of parsimony. Finally, reliable change indices were calculated to assess magnitude of rates of response to treatment, using the approach and guidelines outlined by Jacobson and Truax (1992). RCIs greater than 1.96 are considered to represent evidence of statistically significant improvement (Jacobson & Truax, 1992), while positive RCIs < 1.96 reflect improvement not of a magnitude to be considered significant. A third category was generated to reflect deterioration over time (RCIs < 0).

Results

Model fit and chi-square comparisons from the multiple-groups latent growth curve models are displayed in Table 2 and unstandardized effects are reported below. Effect sizes for the difference in slopes are expressed as Cohen's *d* representing the effect of the treatment condition (immediate ACCESS vs. delayed) on change. Values of .20 are considered small but likely meaningful, .50 is considered a medium effect, and .80 large (Cohen, 1988). Group means on treatment outcomes are presented in Table 3.

Table 2. Summary model fit for multiple group latent growth models

Model	χ^2 (df), *p*	CFI	SRMR	RMSEA [90%CI]
LASSI-2 Motivation	4.153 (5), *p* = .528	1	.077	.000 [.000, .113]
LASSI-2 Time Management	.520 (5), *p* = .991	1	.021	.000 [.000, .000]
LASSI-2 Test Strategies	10.910 (7), *p* = .143	.980	.103	.067 [.000, .140]
LASSI-2 Study Aids	4.865 (5) *p* = .433	1	.064	.000 [.000, .123]
AIM-A Performance/Daily Functioning	10.233 (5), *p* = .069	.946	.039	.092 [.000, .172]
AIM-A Well-Being	35.722 (5), *p* < .001	.717	.135	.222 [.157, .293]
AIM-A Relationships	8.951 (7), *p* = .256	.966	.087	.047 [.000, .126]
GPA	7.330 (5), *p* = .197	.970	.052	.061 [.000, .149]
Average GPA	3.870 (5) *p* = .568	1	.024	.000 [.000, .109]
Credits Earned	1.647 (5), *p* = .896	1	.032	.000 [.000, .055]

CFI = comparative fit index. SRMR = standardized root mean square residual. RMSEA = CI = confidence interval.

Table 3. Observed means of functioning at pretreatment, posttreatment, and post-maintenance by group

	ACCESS						DTC						Between-Group Comparisons	
	Pre (N = 119)		Post (N = 119)		Maintenance (N = 92)		Pre (N = 131)		Post (N = 102)		Maintenance (N = 96)			
Outcome variable	M	D	M	D	M	D	M	D	M	D	M	D	Post *d*	Main. *d*
LASSI Motivation	23.58	6.02	25.74	6.21	28.03	6.30	23.91	5.72	25.03	5.47	25.01	5.97	.12	.49
LASSI Time Management	16.64	4.99	19.96	5.41	21.46	5.94	16.02	4.98	17.45	5.45	17.42	5.58	.46	.70
LASSI Test Strategies	21.61	5.83	25.29	5.56	26.04	5.81	21.97	5.59	23.12	5.99	23.70	5.14	.38	.43
LASSI Study Aids	21.25	5.21	22.74	6.15	23.38	6.02	20.55	6.06	20.74	6.01	20.88	5.40	.33	.44
AIM-A Daily Functioning	41.47	16.79	57.12	19.44	59.41	20.46	42.70	18.73	41.70	18.03	48.09	19.68	.82	.56
AIM-A Well-Being	49.54	15.32	54.65	14.58	55.23	16.20	51.42	17.46	47.42	17.46	52.58	15.61	.45	.17
AIM-A Relationships	65.82	19.14	71.30	19.43	70.54	21.07	64.61	19.44	68.20	19.09	66.83	19.92	.16	.18
GPA	2.59	0.91	2.58	0.98	2.67	1.09	2.56	0.96	2.72	0.93	2.61	0.96	.15	.06
Credits Earned	12.61	3.37	12.32	4.07	11.46	4.88	12.67	3.78	12.56	4.08	12.17	4.37	.06	.15

M = mean. SD = standard deviation. DTC = Delayed Treatment Condition. Pre = pre-intervention assessment. Post = immediate post-intervention assessment. Maintenance/Main = post-intervention maintenance assessment.

Academic Skills and Strategies

When examining growth in motivation, the immediate ACCESS (b = 3.59, SE = .62, p < .001) and the DTC (b = 1.23, SE = .53, p = .021) conditions both increased significantly over time, but the rate of change in motivation was significantly higher in the ACCESS group, Wald (1) = 8.39, p = .004, d = .37 [.12, .62]. The immediate ACCESS (b = 4.23, SE = .56, p < .001) and the DTC (b = 1.52, SE = .45, p = .001) conditions both increased in time management significantly over time, but the rate of change was significantly higher in the ACCESS group, Wald (1) = 14.16, p < .001, d = .48 [.23, .73]. For testing strategies, the immediate ACCESS (b = 4.89, SE = .57, p < .001) and the DTC (b = 1.61, SE = .46, p = .001) condition both increased over time, but the rate of change was significantly higher in the ACCESS group, Wald (1) = 20.97, p < .001, d = .58 [.32, .83]. Finally, the immediate ACCESS (b = 1.78, SE = .54, p = .001) condition increased significantly in use of study aids over time, but the DTC (b = .16, SE = .46, p = .733) condition did not change. The rate of change in use of study aids was significantly higher in the ACCESS group, Wald (1) = 6.28, p = .012, d = .29 [.04, .54].

Educational Outcomes

Neither the immediate ACCESS (b = .03, SE = .11, p = .817) nor the DTC (b = .01, SE = .15, p = .950) condition changed significantly in their GPA over time, and the slopes did not differ significantly between the groups, Wald (1) = .01, p = .932, d = .01 [−.24, .26]. For number of earned credits, neither the immediate ACCESS (b = −.06, SE = .03, p = .065) condition nor the DTC (b = −.04, SE = .03, p = .149) condition changed and the slopes did not differ between the groups, Wald (1) = .20, p = .655, d = .05 [−.20, .30].

Daily Life Performance

When examining the AIM-A Performance/Daily Functioning, the immediate ACCESS (b = 18.01, SE = 2.01, p < .001) condition significantly increased in overall functioning over time, but the DTC (b = 2.30, SE = 1.92, p = .230) condition did not change. The rate of change was significantly higher in the ACCESS group, Wald (1) = 36.43, p < .001, d = .72 [.46, .97].

General Well Being

For AIM-A General Well Being, the immediate ACCESS (b = 6.04, SE = 1.77, p = .001) condition significantly increased in well-being over time, but the DTC (b = −.95, SE = 2.85, p = .738) condition did not. The rate of change was significantly higher in the ACCESS group, Wald (1) = 9.19, p = .002, d = .26 [.01, .51]. Although it is unclear why the multiple-groups latent growth model demonstrated poor model fit for well-being (see Table 3), closer examination of the relative cc ^{2} contribution of each group (ACCESS = 6.05, DTC = 29.67) to the overall chi-square value (cc ^{2} (5) = 35.72, p < .001) demonstrated that the proportion was largely from the DTC group. To explore further, a latent growth model with only the ACCESS group demonstrated good model fit (cc ^{2} (2) = 2.87, p = .24, CFI = .98, RMSEA = .06 [90% CI: .00-.20]) and similar model parameters (intercepts, slopes, model estimated means at each timepoint) to the multiple-groups latent growth model.

Interpersonal Relationships

The immediate ACCESS (b = 5.43, SE = 2.57, p = .035) condition significantly improved in interpersonal relationships over time, but the DTC (b = 2.51, SE = 1.83, p = .169) condition did not. Nevertheless, the rate of change did not differ significantly between the groups, Wald (1) = .71, p = .398, d = .12 [−.13, .37].

Reliable Change Indices

Reliable change indices (RCI; Jacobson & Truax, 1992) were also calculated using pre to post-treatment difference scores. These analyses indicated significantly greater rates of reliable improvement in the immediate treatment condition compared to delay with respect to self-reported daily functioning (17.0% vs. 3.9%), and self-reported use of test strategies (24.2% vs. 4.3%) and time management (16.3% vs. 7.4%). More details are provided in a table in online supplemental materials.

Discussion

This large multi-site study evaluated the impact of a cognitive behavioral intervention for college students with ADHD (ACCESS) on self-report measures of academic, interpersonal, and general daily functioning. Latent growth models examined whether change in outcomes from pre-treatment to post-maintenance (i.e., two semesters later) was differentially predicted by treatment condition (i.e., immediate vs. delayed). Immediate ACCESS participants displayed significantly greater improvements in self-reported motivation, time management, test strategies, use of study aids, as well as overall daily functioning and well-being, with effect sizes ranging from .26 to .72. In addition, reliable change indices provided further evidence for treatment efficacy. Rates of clinically meaningful change were significantly greater in the immediate treatment group with regard to overall daily functioning, test strategies and time management. Overall, results suggest ACCESS promotes meaningful improvement in academic skills and daily functioning persisting into the second academic semester (Table 3).

This study contributes to a growing body of research demonstrating psychosocial interventions (specifically cognitive-behavioral and OTMP treatments) are effective for improving the functioning of college students with ADHD (Anastopoulos et al., 2018b; Fleming et al., 2015; Gu et al., 2018; LaCount et al., 2018; Van der Oord et al., 2020). Although the observed post-treatment effect sizes are comparable with other recent intervention studies among college students with ADHD (e.g., Gu et al., 2018; LaCount et al., 2018; Van der Oord et al., 2020), this is one of the first multi-site studies to examine change in functioning across two academic semesters with a large sample of college students diagnosed with ADHD. Prior work has largely tested short-term interventions (e.g., one semester or less) using pre- to post-treatment designs (e.g., LaCount et al., 2018; Van der Oord et al., 2020). Importantly, our findings demonstrate intervention gains are not only sustained but continue to significantly improve into the following school year. For example, ratings of self-reported academic skills demonstrated small to moderate between-group differences at immediate post-treatment (ds from .12 to .46) that continued to increase in the following semester with moderate to large between-group differences in skills at the post-maintenance assessment (ds from .43 to .70).

Moderate to large effects on functional outcomes provides further evidence for the efficacy of the ACCESS intervention, building on findings demonstrating ACCESS significantly predicted moderate to large change in self-reported inattention symptoms (d = .50) and self-reported EF deficits (ds = .43 – .56), relative to delayed treatment (Anastopoulos et al., 2021). Improvements on a measure of self-reported daily functioning (AIM Performance and Daily Functioning Scale) suggested participants perceived their day-to-day management of responsibilities, challenges, and problems to be much improved (between-group differences at post-treatment and post-maintenance of d = .82 and d = .56, respectively). Example of items on this scale include "ability to take care of everyday responsibilities" and "handling everyday hassles." Improving a general sense of self-management has broad implications – this domain will generalize outside of an academic setting and is relevant for any adult living independently. Further, consistent with previous investigations (Anastopoulos et al., 2018a), the present study demonstrated those who received ACCESS improved on *all* self-reported learning strategies and study skills. Interestingly, participants in both conditions reported improvements in motivation, time management, and use of test strategies, (though those who received ACCESS improved to a significantly greater degree). This is consistent with two other recent RCT's of cognitive-behavioral (Van der Oord et al., 2020) and organization/time management (LaCount et al., 2018) interventions, which found both treatment and control/waitlist conditions improved on study skills including test strategies, motivation, and time management. This could be attributable to the fact that all eligible participants received an important service at baseline: a comprehensive assessment for ADHD, including a report providing documentation of an ADHD diagnosis. This documentation allowed participants in both treatment conditions to access campus services such as medication prescribed to treat ADHD as well as academic accommodations. These on-campus services are only provided to students with ADHD with up-to-date documentation of diagnosis from a comprehensive evaluation. Most universities do not accept an ADHD diagnosis provided by a primary care physician as sufficient. Obtaining a comprehensive assessment for ADHD in the community is often quite expensive (e.g., 1000 USD or more), which precludes many college students with ADHD from attaining such documentation, and therefore, accessing on-campus services (Weyandt & DuPaul, 2013). Of note, our prior work demonstrated the immediate ACCESS condition showed a significant increase in use of university disability services throughout the intervention (d = 1.03), while both conditions were equivalent in their use of ADHD medication (d = .18), which increased in both the ACCESS and delayed treatment conditions (Anastopoulos et al., 2021).

The lack of statistically significant improvements in self-reported interpersonal functioning was unexpected. Of note, the ACCESS condition demonstrated significant improvement in interpersonal relationships on the AIM-A (p = .035), while the control condition did not, however, between group differences were not statistically significant. Although disheartening, these results are consistent with findings from other studies suggesting interpersonal impairment among adults with ADHD may be quite difficult to address. The vast majority of intervention studies for college students with ADHD have either not reported interpersonal outcomes or report nonsignificant change in these outcomes (e.g., Prevatt & Yelland, 2015). Improvements in interpersonal relationships may be difficult to attain even with a targeted approach to improving interpersonal relationships, as demonstrated by an innovative cognitive-behavioral group treatment for couples with elevated symptoms of ADHD (Wymbs & Molina, 2015). Results

from this open trial indicated some improvement (small-to-medium effects on self-reported relationship negativity and partner-reported problematic behaviors at post-treatment); however, nonsignificant change was reported for several measures of interpersonal functioning (Wymbs & Molina, 2015). Of note, interpersonal outcomes have historically been difficult to change in the context of ADHD, even in samples of youth and adolescents (see Mikami, 2015 for a review). Furthermore, in the present study participants in both conditions rated their interpersonal functioning at baseline fairly high (*M'*s = 64.61– 65.82) in comparison to other clinical samples of individuals with ADHD who reported mild/moderate or marked impairment in this domain (Landgraf, 2007; *M* = 61.47 and *M* = 55.21, respectively). Overall, these findings suggest the continued importance of targeting interpersonal relationships more directly in future intervention efforts.

Consistent with other intervention trials focused on college students with ADHD (e.g., LaCount et al., 2018; Van der Oord et al., 2020) as well as interventions focused on adolescents with ADHD (e.g., Langberg et al., 2018; Sibley et al., 2016), treatment groups did not differ significantly on GPA or course credit completion. Participants in both conditions demonstrated stable GPAs, with ACCESS participants on average increasing slightly from pre to post-treatment (+.16) and from post-treatment to post-maintenance (+.08). Participants in the delayed condition made even smaller increases from pre to post-treatment (+.06) and post-treatment to post- maintenance (+.04). In the present study, students in both groups earned GPAs equivalent of "C grades" on average (*M* = 2.58 to 2.62) at pre-treatment, post-treatment, and post-maintenance. This is consistent with other cognitive-behavioral trials reporting nonsignificant GPA change and relatively stable GPAs in the C average range (*M'*s from 2.57 to 2.84; Gu et al., 2018; LaCount et al., 2018). Given that separation between the two conditions on self-reported academic skill use occurred primarily during the second semester, it is possible group differences in GPA would not occur until subsequent semesters with ongoing consistent implementation of skills.

Though promising, findings must be considered in the context of several limitations. First, significant findings were on self-report measures of impairment. This is one of the main challenges with college student studies, as parents and teachers do not have sufficient opportunity to observe behavior. Participants in this study were aware of their assigned intervention condition and the goal of the study. Therefore, it is possible that the self-report findings reflect an expectancy bias. Second, it is important to acknowledge most group leaders and mentors were graduate student clinicians who were aware sessions would be reviewed for fidelity. This may have positively affected the impact of the interventions. ACCESS was designed to be feasible for university student support and counseling centers to implement; thus, it will be important for future work to assess implementation efforts on other campuses. In addition to these limitations, it should be noted that this sample demonstrated intellectual abilities falling in the average to high-average range (*M* = 110, *SD* = 11.57). This is unsurprising, given that participants demonstrated academic achievement levels sufficient to gain entry to a four-year university. However, this does raise the possibility the current findings may not generalize to students with markedly lower intellectual abilities, particularly given the emphasis on learning new knowledge, skills, and strategies. Finally, this study was conducted at two universities classified as four-year public schools; thus, findings may not generalize to other types of postsecondary settings (e.g., small private colleges).

Overall, the ACCESS program appears to have a moderate positive impact on learning and study strategies and daily functioning of college students with ADHD and a large positive impact on symptoms of ADHD and executive function (Anastopoulos et al., 2021). Importantly, this study demonstrates the importance of extending treatment through a maintenance phase, particularly for college students with ADHD. Participants demonstrated consistent growth through the end of the second semester for many domains of functioning, suggesting this extension was important. Future efforts might consider targeting between-session adherence further to increase students' use of skills in their daily life contexts to an even greater degree.

Supplemental material

Supplemental data for this article can be accessed online at http://dx.doi.org/10.1080/15374416.2020.1867989.

Disclosure statement

Drs. Anastopoulos, Langberg, and Eddy are authors on a forthcoming publication entitled, *CBT for College Students with ADHD - A Clinical Guide to ACCESS*. Dr. Anastopoulos is also a coauthor of the *ADHD Rating Scale – 5*, a modified version of which was used in this study.

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