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Self-Monitoring by College Students With ADHD: The Impact on Academic Performance

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Abstract

Objective: There is a lack of empirically supported treatments for college students with ADHD and academic deficits. The current study evaluated self-monitoring, an intervention that may improve academics in children with ADHD, with a college sample diagnosed with ADHD. **Method:** Fifty-three participants were recruited, 41 of which completed the study and are included in the analyses. Participants were randomly assigned to a group that received study skills instruction, goal setting, and self-monitoring instruction (SM+ group; n = 22) or a group that received only study skills and goal setting (SM− group; n = 19). **Results:** Participants in the SM+ group demonstrated significant improvement in their ADHD symptoms, academic behavior, grade point averages (GPAs), and goal attainment. These improvements were not significant for the SM− group. **Conclusion:** These findings suggest that self-monitoring might be used to improve academic performance in college students with ADHD. *(J. of Att. Dis. XXXX; XX(X) XX-XX)*

Keywords

ADHD, college students, academics, self-monitoring, medication adherence

ADHD is a neurobehavioral disorder with characteristic symptoms of inattention, hyperactivity, and impulsivity. It is among the most common psychological disorders in childhood, with more than 9% of children having the diagnosis (Visser, Bitsko, Danielson, Perou, & Blumber, 2010). There is ample evidence that ADHD symptoms continue to manifest into adulthood (Resnick, 2005; Rösler, Casas, Konofal, & Buitelaar, 2010). The estimated prevalence of adults with ADHD is 4.4% in an American population (Kessler et al., 2006), with prevalence ranging from 2% to 8% among college students (DuPaul, Weyandt, O'Dell, & Varejao, 2009).

Individuals with ADHD continue to require services past childhood. Approximately 25% of students who receive academic accommodations in college have ADHD (Weyandt & DuPaul, 2008). Accommodations often include extended time testing, preferential seating, testing in a distraction reduced setting, and copies of lecture notes. Despite the prevalence of accommodations and continuation of medication by many college students previously diagnosed with ADHD, college-aged students with ADHD are less likely to attend college compared with those without the disorder. Those who do are more liable to drop out, experience academic probation, have lower grade point averages (GPAs), and endorse more academic difficulties (DuPaul et al., 2009). Despite these impairments, few college students receive nonpharmacological treatments and lack of treatment is associated with more severe impairment in several areas, including educational achievement (Goodman, 2009).

Psychosocial Interventions for ADHD

There are several evidence-based psychosocial interventions for youth (Pelham & Fabiano, 2008) and adults with ADHD (Kolar et al., 2008; Mongia & Hechtman, 2012). The childhood literature has evaluated the effects of specific behavioral components (e.g., behaviorally based parent training, self-monitoring, contingency-based procedures), whereas the adult literature has focused more heavily on cognitive-behavioral treatment packages. There is limited research on the contributions of specific behavioral and academic intervention components for adults with ADHD (DuPaul et al., 2009; Weyandt & DuPaul, 2008). One behavioral intervention that may be beneficial for adults with ADHD is self-monitoring.

Self-monitoring involves teaching an individual to observe and record his or her behavior with the goal of changing the behavior in the future (Axelrod, Zhe, Haugen,

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& Klein, 2009; DuPaul & Stoner, 2010). Self-monitoring has been effective in improving a number of academic behaviors in youth, including on-task behavior (Moore, Anderson, Glassenbury, Lang, & Didden, 2013; Rafferty, Arroyo, Ginnane, & Wilczynski, 2011), homework completion (Falkenberg & Barbetta, 2013; Merriman & Codding, 2008), and academic performance (Mooney, Ryan, Uhing, Reid, & Epstein, 2005; Perry, Albeg, & Tung, 2012).

Although self-monitoring has rarely been evaluated as a treatment for improving the academic performance and time management of college students with ADHD, a few studies have used self-monitoring to improve the academic performance of college students as a class requirement. Richards, McReynolds, Holt, and Sexton (1976) required students in an introductory psychology course to monitor their studying and reading every night. Students who self-monitored, on average, reported performing better than students who received study skills training without self-monitoring. Similarly, Morgan (1985) found that college students who monitored behavior related to short-term course goals performed significantly better than a no-treatment control group. In other studies, students instructed to monitor their study time earned higher course grades than a control group in college courses (Lan, 1996; Lan, Bradley, & Parr, 1993; Mount & Tirrell, 1977). With a nonclinical college sample, self-monitoring has also been shown to improve standardized test preparation (Mahoney, Moore, Wade, & Moura, 1973) and writing quality (Cho, Cho, & Hacker, 2010; Kauffman, Ge, Xie, & Chen, 2008). In addition, self-monitoring has been used with adults to improve medical adherence (e.g., Ruppar, Conn, & Russell, 2008). This may be important considering that pharmacotherapy is a common treatment for adults with ADHD (Yozwiak, 2010), and difficulties with medication adherence have been noted (Hartung et al., 2013; Rabiner et al., 2009).

Although most research supports the use of self-monitoring for improving college academics, other studies have suggested there may be limited additive benefits of self-monitoring when study skills training is conducted (Morgan, 1987; Van Zoost & Jackson, 1974). Therefore, the additive effects of self-monitoring when incorporated with other academic treatment components should be considered.

Objective

Despite the mounting evidence for self-monitoring as an intervention for children with ADHD and nonclinical adults, it has not been evaluated as an intervention for academic performance or medication adherence in a clinical college sample with ADHD. Considering college students with ADHD are at risk for academic failure or underachievement, and there is a paucity of research evaluating interventions for this population, the current study analyzed the effects of self-monitoring using an additive design. We hypothesized that college students diagnosed with ADHD who underwent a treatment with a self-monitoring component would obtain higher grades, endorse less ADHD symptoms, engage in more positive study skills, further attain goals, and improve their medication adherence more so than students whose treatment did not include a self-monitoring component.

Method

Participants and Setting

Participants were recruited through the psychology department research system and received credit for their participation. All sessions were conducted in an individual therapy room. The experimenter was a master's level clinician supervised by a licensed clinical psychologist. Participant requirements included: enrollment as a college student, prior ADHD diagnosis, a current psychotropic prescription to target ADHD symptoms, and regular computer access. After a participant signed up for the study, the experimenter sent an email to confirm the requirements. In total, 53 participants attended the first session; all met the inclusion criteria. One participant did not provide consent and discontinued the study before initiating the first session activities. The experimenter randomly assigned (using a random number generator) the remaining 52 participants to either the study skills and self-monitoring treatment group (SM+) or to the study skills only group (SM−). Initial random assignment resulted in 27 SM+ participants and 25 SM− participants. Of these participants, 11 completed the first session but failed to attend later appointments and discontinued the study (see Figure 1 for participant progress). Of the remaining 41 participants who completed the study, the sample was predominately female (75.61%) and Caucasian (80.49%). Participants' ages ranged from 18 to 32 years with a mean age of 20.48 years. In regard to college experience, 21.95% were in their first year, 24.39% second year, 34.15% third year, and 19.51% fourth year or beyond.

Measures

Adult ADHD Self-Report Scale (ASRS). The ASRS is a measure used to aid in the diagnosis of ADHD in adults (Kessler et al., 2005). It consists of 18 items using adult-directed language, corresponding to the ADHD diagnostic criteria in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association [APA], 1994). Each item is rated on a 5-point scale ranging from *never* to *very often*. The ASRS was used to identify national prevalence rates in the National Comorbidity Survey-Replication study (Kessler et al., 2006) and has adequate psychometric properties when implemented with

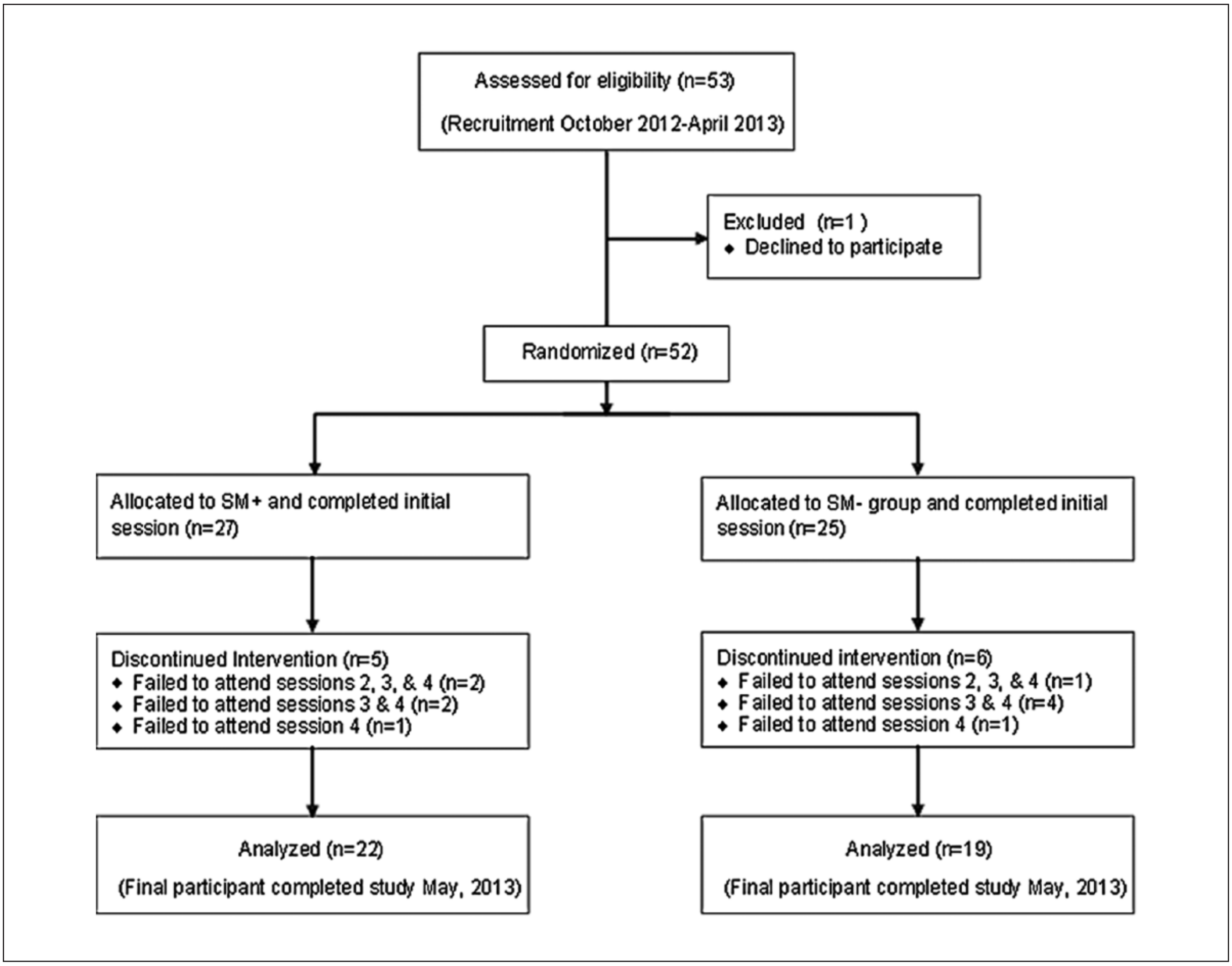

Figure 1. Participant progress through the study.
Note. SM = self-monitoring.

college students (Fuller-Kilgore, Burlison, & Dwyer, 2012; Garnier-Dykstra, Pinchevsky, Caldeira, Vincent, & Arria, 2010). The ASRS was a treatment outcome measure in the current study. The experimenter calculated scores by counting the total number of symptoms endorsed in the significant range (rating of 3, 4, or 5) at prettest and posttest.

Conners' Adult ADHD Rating Scales–Self-Report (CAARS). The CAARS (Conners, Erhardt, & Sparrow, 2002) is a norm-referenced measure of ADHD symptoms in adults. The measure contains 66 statements responded to with a 4-point scale. The CAARS has sufficient internal reliability (range from .86 to .90); test–retest reliability (1 month correlation range from .80 to .91); and sensitivity (82%) and specificity (87%) when compared with diagnosis from an expert clinician (Erhardt, Epstein, Conners, Parker, & Sitarenios, 1999). The standardized scores on the *DSM-IV* scales of this questionnaire were used for descriptive purposes to assess for severity and presentation of ADHD symptoms in our sample.

Although both the ASRS and the CAARS were designed to align with the *DSM-IV* (APA, 1994), they are likely to correspond well with the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed; *DSM-5*; APA, 2013), as the essential symptoms for an ADHD diagnosis remained relatively stable between the two editions.

Medication adherence. The medication adherence questionnaire, designed for the current study, assessed participants' adherence to their stimulant prescriptions. It is a 5-item measure (e.g., "I take my medication on a regular basis," "When I take my medication I take the recommended dose") with responses on a 5-point scale (*never* to *almost always*). Items were averaged to obtain a medication adherence score, with high scores representing better adherence.

School Success Checklist (SSC). Participants rated their academic behaviors using the SSC. The SSC was adapted for the current study from the Diagnostic Checklist for School Success designed for adolescents with ADHD (Robin, 1998), with items irrelevant to college courses removed or slightly modified. The assessment includes 42 statements about academic behaviors divided into six categories: inattention, organization, test taking, note taking, reading comprehension, and classroom behavior. Each item is rated according to the past 2 weeks using a 5-point scale. The mean of all items on the SSC, and on individual categories on the SSC, was used to assess academic behaviors (higher scores represent more positive academic behaviors).

Mini International Neuropsychiatric Interview (M. I.N.I.). The M.I.N.I. is a brief structured interview assessing a wide range of psychological disorders (Sheehan, Janavs, Harnett-Sheehan, Sheehan, & Gray, 2009). The M.I.N.I. has similar positive predictive and negative predictive power as longer interviews (Lecrubier et al., 1997), but is more efficient in administration time.

Goal Attainment Scale (GAS). The GAS is a standard way of assessing goal progress to track clinical progress (Kiresuk & Sherman, 1968). Participants started by setting two to three goals and assigning weights to the goals relative to priority. Next, possible outcomes were behaviorally defined and labeled on a scale ranging from "−2" or worst expected outcome to "+2" or best expected outcome. Goal progress was later rated using this scale. The experimenter multiplied the participant's rating of each goal by the weight of the goal then divided by the sum of all weights to form a goal attainment score (possible range from −2 to +2).

Grade information form. Participants documented all grades received while enrolled in the study and the weight of each exam/assignment to the overall course grade. The experimenter calculated participants' posttest GPAs by averaging the grades received while participating in the study (weighted by the contribution to the final course grade), calculating a letter grade for each course, and transposing these into a GPA using the standard university point system.

Treatment Evaluation Inventory–Short Form (TEI-SF). The TEI-SF is a measure of acceptability designed for use with childhood interventions. The TEI-SF has adequate agreement with the longer form (Kelley, Heffer, Gresham, & Elliott, 1989). This questionnaire was modified to accommodate an adult-directed intervention. The measure includes eight items and uses a 5-point Likert-type scale (higher scores represent more acceptability). Items on the TEI-SF were averaged to obtain an acceptability score.

Procedures

The experimenter completed an integrity checklist during each session. In the initial session, the experimenter told all participants that the goal of the study was to improve academic performance. Participants then completed the informed consent, demographic form (including cumulative GPA used as pretest GPA), ASRS, CAARS, SSC, and medication adherence form. The therapist also administered a brief intake designed for this study, which included relevant history and the M.I.N.I. Subsequently, all participants identified academic-related and objective goals using the GAS. Completion of paperwork and interviews generally took 30 to 60 min.

Next, the experimenter spent 20 to 30 min discussing study skills with two informational handouts. The first covered a method for reading textbooks which has been shown to improve college exam scores called the SQ4R (Hartlep & Forsyth, 2000). The SQ4R includes several steps: (a) *s*urveying the book, (b) writing *q*uestions about the topic, (c) *r*eading the text and answering questions, (d) *r*eciting the answers, (e) *r*eflecting on connections in the text, and (f) *r*eviewing. The second handout reviewed general study skills (e.g., organization, distraction-free studying, self-testing) suggested to improve college academics in prior research (e.g., Crede & Kuncel, 2008; Proctor, Prevatt, Adams, & Reaser, 2006; Ramdass & Zimmerman, 2011). After review of study skills, the experimenter randomly assigned the participant to a group. For participants in the SM− group, this was the last step of the initial session.

Participants assigned to the SM+ group spent an additional 30 to 40 min reviewing self-monitoring procedures. The experimenter introduced self-monitoring with a brief handout and helped the participant create a monitoring form based on his or her personal goals and schedule. Next, the experimenter and participant identified behaviors to monitor in the intervention. All participants agreed to monitor class attendance and medication adherence. Additional items were drawn from the GAS and SSC. The experimenter ensured all items were objective and observable. Examples of self-monitoring items include "I checked my planner," "I avoided social media sites in class," and "I read assignments for today's class." The self-monitoring checklist contained behaviors listed separately for each day, and the participant recorded behaviors by marking yes, no, or not applicable (n/a) for each item. Because the checklist was tailored to the student, the number of items varied across participants. Items also varied across days for the same participant to accommodate course schedules. Participants used the same form from one week to another. The self-monitoring form also contained a progress report tab, in which the percentage of self-monitoring behaviors successfully completed each day was tabulated and presented graphically. Participants were instructed to complete the checklist and check the progress report daily. The experimenter assessed participants' adherence through integrity checks every 2 to 4 days. A participant passed the integrity check if he or she updated the form at least 48 hr prior to the check. If a participant failed the integrity check, the experimenter sent an email reminder to complete the form.

The intervention form was designed using Microsoft Excel and accessed by the participant and experimenter using an application that allows for sharing of documents between people officially invited. All participants downloaded the program to their personal computers, set up an account, and joined a shared folder that contained the forms.

Participants in both groups attended two 10- to 20-min check-in sessions. Sessions were initially scheduled 14 to 21 days apart. After rescheduling and accounting for holidays, the mean length between sessions was 14.98 and 14.80 days for the SM+ and SM− group, respectively (range = 7-27 days). For students in the SM+ group, the experimenter provided praise for self-monitoring items successfully completed and discussed strategies to improve items frequently marked no on the form. For students in the SM− group, the experimenter and participant discussed the use of study skills and general academic progress.

At the final session, all participants completed the medication adherence form, ASRS, SSC, GAS ratings, and grade information form. The SM+ group also completed the TEI-SF. Participants in the control group were introduced to the self-monitoring treatment and offered a future appointment to set up a personalized monitoring form.

Table 1. Demographic and Outcome Variables for the SM+ and SM− groups at Prettest.

Demographic	SM+ (*n* = 22)	SM− (*n* = 19)	*t*(39)	*p*
Age	20.91 (2.84)	20.11 (1.56)	1.10	.28
CAARS[a]				
Inattention	77.86 (8.71)	71.68 (11.77)	1.93	.06
Hyperactivity	63.50 (5.82)	63.74 (11.21)	0.07	.95
Total ADHD	74.32 (6.27)	71.21 (12.37)	0.92	.36
M.I.N.I. screens[b]	1.91 (2.04)	1.63 (1.73)	0.30	.76
ASRS	13.14 (3.18)	11.37 (3.79)	1.62	.11
SSC	3.25 (0.39)	3.26 (0.51)	0.08	.93
GPA[c]	2.65 (0.49)	3.02 (0.48)	2.44	.02
Medication adherence	3.99 (0.55)	3.93 (0.63)	0.31	.75

Note. SM = self-monitoring; CAARS = Conners' Adult ADHD Rating Scale; M.I.N.I. = Mini International Neuropsychiatric Interview; ASRS = Adult ADHD Self-Report Scale; SSC = School Success Checklist; GPA = grade point average.
[a]Mean standard score.
[b]Mean number of positive screens on the M.I.N.I.
[c]Significant difference between SM+ and SM− group at prettest.

Results

Preliminary Analyses

A comparison of demographic and dependent variables was conducted using the measures completed at the initial session. Despite random assignment to groups, the SM− had a significantly higher average GPA than the SM+ group at prettest. In addition, the SM− group endorsed slightly less symptoms on the CAARS inattention scale at pretest than the SM+ group, and this difference was just short of significant. There were no significant differences between the two groups on any other demographic variable or outcome variables at prettest (see Table 1 for additional information).

Analyses were also conducted to compare participants who dropped out from those who completed the study. Participants who completed the study and those who dropped out had no significant differences based on gender, $\chi^2(1, N = 52) = 0.19$, $p = .66$; race, $\chi^2(4, N = 52) = 3.61$, $p = .46$; GPA, $t(50) = 0.12$, $p = .91$; ASRS, $t(50) = 0.71$, $p = .48$; SSC, $t(50) = 1.24$, $p = .11$; or CAARS ADHD total scale, $t(50) = 0.66$, p = 51. There was also no significant difference in age between participants who completed the study ($M = 20.54$) and those who did not complete the study ($M = 20.27$), with a range of 18 to 32 years for both groups, $t(50) = 0.28$, $p = .78$. However, participants who dropped out of the study were significantly earlier in their college career ($M = 1.7$ years) compared with participants who completed the study ($M = 2.5$ years), $t(50) = 2.3$, $p = .03$.

ADHD Symptoms and Comorbidity

At pretest, 85.37% of our participants reported clinical or subclinical elevations (standard score ≥ 60) on the CAARS *DSM-IV* ADHD Total scale, 92.68% reported elevations on the Inattentive Symptoms scale, and 68.29% reported elevations on the Hyperactive-Impulsive scale.

According to the M.I.N.I., several participants screened positive for comorbid symptom profiles. Of participants who completed the study, 75.61% reported the presence of one or more past or present comorbid conditions (see Table 2).

Treatment Effects

To evaluate the effects of the SM intervention, five main dependent variables were assessed: ASRS, medication adherence, SSC, GAS, and GPA. A mixed-design MANOVA revealed a significant interaction effect for the composite of the dependent variables, $F(5, 35) = 5.56$, $p = .001$, partial $\eta^2 = .44$ (see Table 3). Follow-up analyses displayed significant interaction effects for the ASRS, $F(1, 39) = 13.61$, $p = .001$, $\eta^2 = .26$; SSC, $F(1, 39) = 4.81$, $p = .03$, $\eta^2 = .11$; GAS, $F(1, 39) = 23.67$, $p < .001$, $\eta^2 = .38$; and GPA, $F(1, 39) = 7.16$, $p = .01$, $\eta^2 = .16$ (see Figure 2). There was no significant effect for medication adherence, $F(1, 39) = 0.74$, $p = .39$, $\eta^2 = .02$.

Table 2. Number of Participants Screening Positive for Comorbidity on the M.I.N.I.

Screener	SM+ (*n* = 22)	SM− (*n* = 19)
Generalized Anxiety Disorder	7	4
Alcohol abuse	6	4
Major Depressive Episode past	4	5
Alcohol dependence	3	3
Panic disorder	3	3
Social phobia	3	3
Obsessive-Compulsive Disorder	2	3
Specific phobia	4	1
Substance abuse	2	2
Antisocial Personality Disorder	2	1
Bipolar I	1	1
Bipolar II	1	1
Substance dependence	2	0
Major Depressive Episode present	1	0
Agoraphobia	1	0
Posttraumatic Stress Disorder	0	1
Bulimia	0	1

Note. M.I.N.I. = Mini International Neuropsychiatric Interview; SM = self-monitoring.

Table 3. Dependent Variable Scores for the SM+ and SM− Groups at Posttest.

Measure	SM+ *M* (*SD*)	SM− *M* (*SD*)	*t*(39)	*p*
ASRS	7.59 (5.23)	11.84 (4.25)	2.83	<.01
SSC	3.66 (0.53)	3.34 (0.54)	1.89	.07
GAS	0.77 (0.67)	0.24 (1.91)	4.86	<.01
GPA	3.03 (0.48)	2.89 (0.68)	0.72	.47
Medication adherence	4.05 (0.57)	4.12 (0.69)	0.31	.76

Note. SM = self-monitoring; ASRS = Adult ADHD Self-Report Scale; SSC = School Success Checklist; GAS = Goal Attainment Scale; GPA = grade point average.

To follow up significant interactions for individual variables, the experimenter conducted separate paired sample *t* tests for the SM+ and SM− groups. Using a Bonferroni correction to account for the four comparisons in each group (significant $p = .0125$), all four dependent variables showed significant improvement in the SM+ group: (a) fewer symptoms on the ASRS at posttest than at pretest, $t(21) = 3.92$, $p = .001$, $d = 1.29$; (b) more positive academic behaviors on the SSC, $t(21) = 3.71$, $p = .001$, $d = 0.89$; (c) considerable goal attainment, $t(21) = 5.40$, $p < .001$, $d = 1.63$; and (d) higher GPAs compared with prior performance, $t(21) = 3.14$, $p = .005$, $d = 0.72$. The SM− group did not show improvement on either the ASRS, $t(18) = 0.76$, $p = .46$; SSC, $t(18) = 0.85$, $p = .41$; GPA, $t(18) = 0.89$, $p = .38$; or the GAS, $t(18) = 1.36$, $p = .19$. See Table 3 for comparisons of the SM+ and SM− groups at posttest.

As a secondary analysis, we conducted dependent-sample *t* tests on the six subcategories on the SSC to determine if specific academic behaviors improved more so than others. Using a Bonferroni correction ($p = .008$), participants showed improvements on the subcategories of inattention, $t(21) = 3.60$, $p = .002$, $d = 0.81$; test taking, $t(21) = 4.67$, $p < .001$, $d = 1.00$; and reading, $t(21) = 3.72$, $p = .001$, $d = 0.86$. Subcategories of organization, note taking, and classroom behavior did not change significantly (see Table 4).

In addition to statistical effects, we analyzed clinically significant change by evaluating the percent of participants who improved on each variable by at least two standard deviations of the pretest scores (e.g., McGowan & Behar, 2012). In the SM+ group, 40.91% (ASRS), 22.73% (SSC), and 13.64% (GPA) of participants made clinically significant improvements. Only 5.26% (ASRS), 0.00% (SSC), and 5.26% (GPA) of participants made clinically significant changes in the SM− group. In addition, 27.27% of SM+ participants made clinical improvements in their goal attainment (i.e., attained more than expected outcomes), as opposed to only 5.26% in the SM− group. Significantly more individuals in the SM+ group demonstrated clinical improvements on the ASRS, $\chi^2(1, N = 41) = 7.03$, $p < .01$, and on the SSC, $\chi^2(1, N = 41) = 4.92$, $p = .03$. Significant differences were not found for the GAS, $\chi^2(1, N = 41) = 3.49$, $p = .06$, or GPA, $\chi^2(1, N = 41) = 0.81$, $p = .37$.

Finally, participants' adherence to the intervention was determined using the integrity checks. The experimenter conducted a mean of 18.23 integrity checks ($SD = 2.33$) for each participant. Participants passed a mean of 67.02% of checks, with remarkable variability between participants ($SD = 22.78\%$). Despite variable integrity, participants rated the procedures as highly acceptable on the TEI-SF ($M = 4.26$, $SD = 0.56$).

Copies of measures, additional demographic information, or other details related to the results are available by contacting the first author.

Discussion

Participants in the self-monitoring group improved their academic behavior (especially inattention, test taking, and reading), ADHD symptoms, GPA, and goal attainment. These improvements were not observed in the SM− group who received all active components of the intervention with the exception of self-monitoring. More individuals in the SM+ group displayed clinical improvements on each of these variables, and the difference in clinical improvement

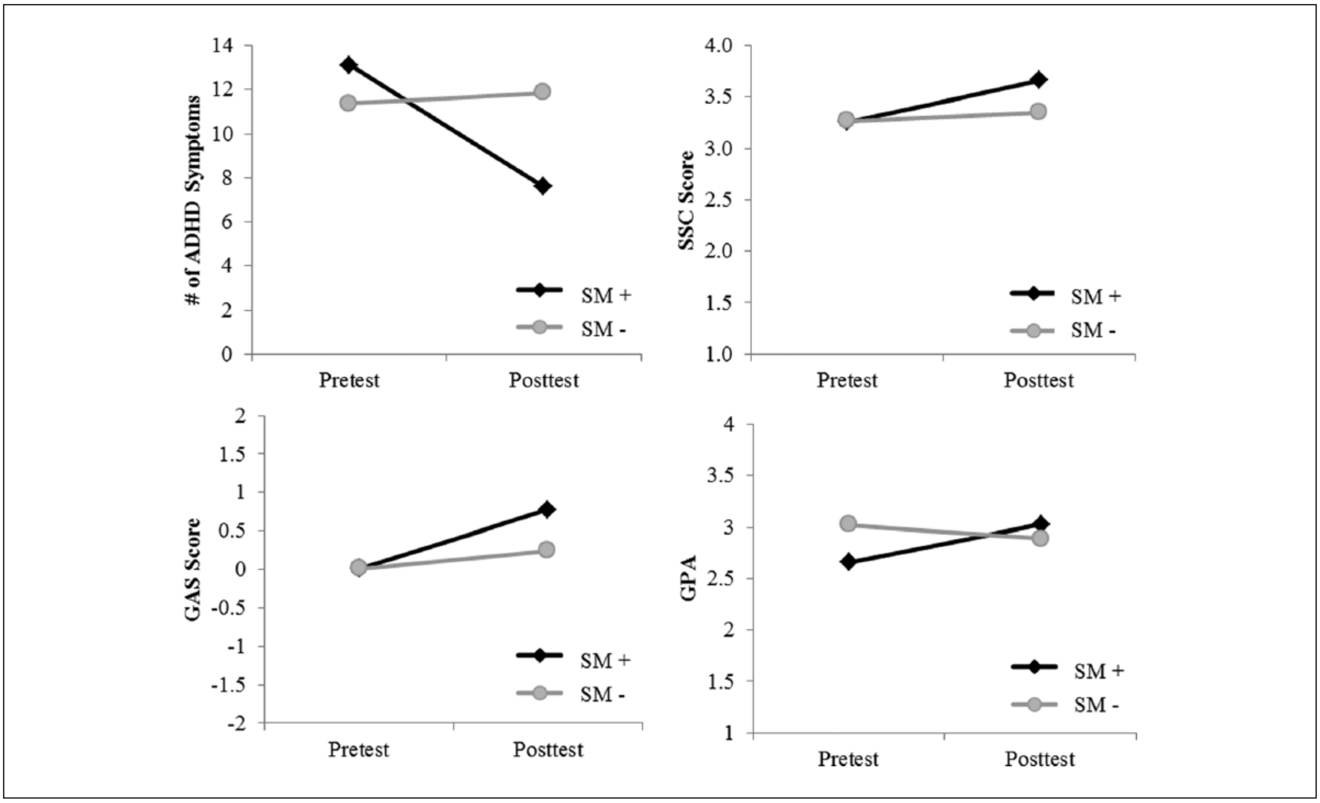

Figure 2. The mean number of symptoms endorsed in the significant range on the ASRS, mean scores on the SSC, GAS scores, and GPAs.

Note. ASRS = Adult ADHD Self-Report Scale; SSC = School Success Checklist; GAS = Goal Attainment Scale; GPAs = grade point averages; SM = self-monitoring.

Table 4. School Success Checklist Subcategory Scores.

	SM+		SM−	
Subcategory	Prettest *M* (*SD*)	Posttest *M* (*SD*)	Prettest *M* (*SD*)	Posttest *M* (*SD*)
Inattention[a]	3.21 (0.68)	3.77 (0.69)	3.35 (0.70)	3.38 (0.61)
Organization	3.66 (0.84)	4.06 (0.83)	3.31 (0.91)	3.63 (0.76)
Test taking[a]	3.08 (0.43)	3.56 (0.53)	3.14 (0.63)	3.30 (0.62)
Note taking	3.80 (0.61)	4.02 (0.82)	3.78 (0.58)	3.80 (.94)
Reading comprehension[a]	2.85 (0.52)	3.38 (0.70)	3.04 (0.68)	3.09 (0.77)
Classroom behavior	3.39 (0.61)	3.52 (0.57)	3.21 (0.66)	3.13 (0.82)

Note. SM = self-monitoring.
[a]Significant improvement from prettest to posttest for the SM+ group.

between the two groups was significant for both ADHD symptoms and study skills. Self-monitoring provided an additive benefit when compared with study skills instruction and goal setting alone. The use of self-monitoring with adults with ADHD is novel and demonstrates that a method used to improve academic performance in children with ADHD can generalize to a college population. Consistent with previous research (Moore et al., 2013), the self-monitoring intervention did not require an external agent-of-change (e.g., teacher or parent) or a tangible reinforcement, making it a feasible intervention for college students. This is especially important because adults with ADHD historically struggle in academic settings (DuPaul et al., 2009) and there is a dearth of empirically supported interventions for this population.

Counter to expectations, self-monitoring did not improve medication adherence. The medication adherence questionnaire was created to assess specific causes of medication misuse in college students with ADHD (Hartung et al., 2013). However, internal validity for the measure was poor at prettest (Cronbach's $\alpha = .42$), suggesting the results of medication adherence in this study should be interpreted cautiously. Future research could target this area with established assessment tools. For example, a pill count at each session or more sophisticated systems such as the Medication Event Monitoring System (MEMS), in which a small chip in the cap of prescription bottles records when the bottle is opened, could allow for a more reliable measure of medication adherence in future studies and provide a better measure of the effects of self-monitoring on medication adherence (e.g., Schmitz, Sayre, Stotts, Rothfleisch, & Mooney, 2005).

Our results suggest that self-monitoring may be somewhat robust to treatment integrity errors within an adult population when the intervention is self-administered. Considering the ample evidence for the importance of treatment integrity (e.g., Cochrane & Laux, 2007; Cook et al., 2012), additional research is needed to identify the degree to which integrity may affect the effectiveness of self-monitoring.

Although participants rated the intervention as highly acceptable, several participants dropped out of the study (22.64%). Those who dropped out were on average earlier in their college careers, but no difference was found in age. This suggests that time spent enrolled in college, as opposed to a factor related to age, might have affected whether participants completed the study. For example, experience with poor grades or nearing graduation could increase participant's motivation to improve academics. Alternatively, skills acquired later in college (e.g., familiarity with technology) could serve as prerequisites for the intervention, allowing the procedures to be completed with less response effort. Future research may consider measuring participant's motivation or lowering the response effort of the intervention by requiring monitoring on a leaner schedule (e.g., every other day) or decreasing the number of items on the checklist to determine whether response effort affects drop-out rates. Other variables that may moderate or mediate both attrition and success with the intervention are also important areas for future development.

A limitation of this study was the difference in GPA and the CAARS Inattention scale between the two groups at baseline. Further analyses are required to determine if these variables contributed to our findings. In addition, inclusion criteria were based on self-report of previous ADHD diagnosis. It may be informative to compare this group with a group diagnosed by more stringent methods and to compare subgroups dependent on primary symptom presentation. Another possible limitation was the additional therapist contact experienced by the SM+ group compared with the SM− group. Although the groups were similar to a large extent (e.g., same number of sessions and academic focus), the SM+ group's initial session and follow-up sessions were slightly longer, they invested more time in completing the forms, and they received email reminders. This may have altered the participants' relationship with the experimenter and their expectancies.

The current study takes the first step at identifying treatment components that might help improve academic success for adults with ADHD. These results provide support for including self-monitoring in psychosocial treatment packages for this population and create a basis for extended research on self-monitoring and other behaviorally based treatments for college students.

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Mindy C. Scheithauer is now at Emory University, Marcus Autism Center at Children's Healthcare of Atlanta. This project was conducted as a dissertation in partial fulfillment of a doctoral degree in psychology for the first author at Louisiana State University.

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