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Potential Mechanisms of Action in the Treatment of Social Impairment and Disorganization in Adolescents with ADHD

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Abstract

Two important domains that can be impaired in adolescents with ADHD are organization and social functioning; however, the development of interventions to target these areas in adolescents is in the early stages. Currently, small efficacy trials are beginning to be used to conduct preliminary tests on the proposed mechanisms of action for these interventions. These two studies examined the efficacy of organization and social functioning interventions for adolescents with ADHD, as well as the potential mechanisms of action for each intervention. Results from the organization intervention provide support for a significant relationship between performance on the organization checklist and overall GPA; however, there was no meaningful pattern of relationships between achieving mastery of the organization tasks and grades within quarter. Further, results from the social functioning intervention support a moderate relationship between performance on process measures of response to the intervention and outcome measures of social functioning. Results of this study provide implications for modifications to the measures and intervention procedures in future research.

Keywords

ADHD; Adolescents; Mechanism of action; Organization; Social functioning

Introduction

Attention-deficit hyperactivity disorder (ADHD) is a high-incidence, chronic disorder associated with adverse outcomes throughout the lifespan. Although ADHD symptoms appear less conspicuous as children mature, the related impairments can actually prove more costly during adolescence than childhood (e.g., motor vehicle accidents, teenage pregnancy, and occupational failure), and adolescents with ADHD are at significantly higher risk than their peers for school suspensions, academic failure, social impairment, classroom behavior problems, and school dropout (Barkley, Fischer, Edelbrock, & Smallish, 1990).

Two areas of impairment that appear to be critical to adolescents with ADHD are disorganization and social problems. Indeed, disorganization comprises one of the

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diagnostic criteria for ADHD ("often has difficulty organizing tasks and activities" American Psychiatric Association, 2000, p. 92), and for school-age children, disorganization typically manifests as difficulty with homework, having necessary materials for class, managing long-term projects, and keeping track of personal belongings. Underscoring the central role of disorganization in ADHD, researchers have found that parent and teachers' endorsement of the disorganization symptoms is common for youth with the disorder and uncommon for youth without the disorder. This symptom has been reported to have the best positive predictive power (PPP) and negative predictive power (NPP) out of all symptoms for the diagnosis of ADHD inattentive type, and high NPP for ADHD combined type (Owens & Hoza, 2003). In addition, parents of children with ADHD are more likely to report that their children are worse at organizing time than parents whose children are not diagnosed with ADHD (Zentall, Harper, & Stormont-Spurgin, 1993). As children enter secondary schools, organizational demands for materials, tasks, and time increase well beyond that required for success in elementary school. Secondary school educators expect students to independently manage planning for long-term projects, studying appropriately for tests, and completing and turning in assignments for multiple classes and teachers.

In addition to disorganization, social functioning is one of the most common areas of impairment in children with ADHD, with half of youth with the disorder exhibiting social problems (Blachman & Hinshaw, 2002; Barkley, 1998). Parents and teachers report that adolescents with ADHD experience greater levels of peer rejection as compared to peers without the disorder (Bagwell, Molina, Pelham, & Hoza, 2001). Moreover, parents of adolescents with ADHD report that their adolescents have fewer close friendships and are more negatively influenced by peers than do parents of adolescents without the disorder. Indeed, adolescents with ADHD are more likely to have friends in deviant peer groups than adolescents without ADHD and are more likely to engage in substance use than peers without ADHD (Marshal, Molina, & Pelham, 2003). Problems with social impairment and disorganization are likely to contribute to poor long-term outcomes related to problems with school, graduation, employment, and stable relationships.

The development of interventions to target these two critical areas of impairment in adolescents is still in its early stages. Treatment development and evaluation research has been conducted on interventions targeting disorganization in children (Abikoff et al., 2009) and with young adolescents (Evans et al., 2009). Similarly, studies have been published demonstrating modest improvements in the social functioning of young adolescents with ADHD (Evans, Schultz, DeMars, & Davis, in press; Evans, Serpell, Schultz, & Pastor, 2007). However, few studies have examined treatments specifically designed for high school students with ADHD. In some cases, those studies have failed to demonstrate clinically meaningful improvements (e.g., Barkley, Edwards, Laneri, Fletcher, & Metevia, 2001). In other cases, research has shown promising results at a programmatic level, leaving questions regarding the individual contribution of component interventions. For example, a series of studies has focused on the development of a school-based treatment program for young adolescents with ADHD (Challenging Horizons Program; CHP) that involves an after-school model (Evans et al., in press) and an in-school consultation version (Evans et al., 2007). In addition, the results of a pilot study of a model of the summer treatment program have been reported that incorporated many of the interventions that comprise the CHP

(Sibley et al., in press). Components of these programs that target both social impairment (Interpersonal Skills Group; ISG) and disorganization (organization intervention) were incorporated into a school-based treatment program for high school students with ADHD, and the findings indicate improvements in teacher ratings of both academic and social functioning (Evans, Schultz, Sadler, & Brady, 2010). Although these are promising findings, it is unclear which aspects of the program were successful or how those elements led to desired changes among the participants.

Mechanisms of Action

In addition to evaluating treatment outcomes, it is critically important to examine the hypothesized mechanisms of action (Kazdin & Nock, 2003). A mechanism is the process by which therapeutic change can occur. Even in small trials, evidence can be evaluated to support or contradict the rationale of those developing the treatments and lead to revisions in the development process. Thus, it is essential to examine potential mechanisms of action among the emerging interventions that show promise for adolescents with ADHD. Mechanisms of action have the potential to inform further development of treatments and to lead to revisions in the development process. Kazdin and Nock outlined seven requirements that should be met in order to demonstrate a mechanism of action. These seven requirements include demonstrating (1) strong association between proposed mechanism and outcomes, (2) specificity, (3) gradient, (4) experiment, (5) temporal relation, (6) consistency, and (7) plausibility and coherence. Although small studies do not generate the necessary data to evaluate all seven requirements, some yield results that may provide preliminary support for or against hypothesized mechanisms. In particular, small studies can often involve experiments that provide data that allow the strength of the relationship between performance on key tasks and outcomes to be assessed. Based on the requirements outlined by Kazdin and Nock, the present studies focused on demonstrating a relationship between the proposed mechanisms within the organization intervention, planner intervention and ISG and associated outcome measures to determine whether the hypothesized mechanisms of action are truly associated with positive changes in outcomes.

Present Studies

We conducted two studies to evaluate the response to each of these interventions and the relationship between the proximal measures of the intervention process and the outcomes per the recommendations of Nock (2007). Relationships between proximal measures of response to an intervention and outcomes can also be established by examining differences in outcome scores from those who respond and those who do not. Implications for the next stages of treatment development are presented.

Method

Overview

Both study one and study two occurred concurrently with the same participants as part of a larger treatment outcome study. Study one focused on the organization intervention, which occurred over the course of an entire school year and was implemented during the school day by a skills coach. Study two focused on the social functioning intervention, ISG, which

occurred for 10 weeks and was implemented in the evening by a graduate student clinician, undergraduate student researchers, and the skills coaches. All information regarding participants, recruitment procedures, and treatment fidelity are reported in study one method.

Study 1

Method

Participants—Thirty-six adolescents with ADHD were recruited from two public high schools in rural Virginia to participate in a yearlong study of school-based psychosocial interventions for academic and social impairments. At intake, participants were between 13 and 17 years of age (Mdn = 15). Boys (86.4%) outnumbered girls at a ratio slightly higher than expected among children with ADHD (APA, 2000). Most participants (69.4%) lived in two-caregiver households, followed by divorced caregivers living separately (27.8%), and single never-married caregivers (2.8%). Based on caregiver report, slightly more than half of the participating families (52.8%) earned $60,000 per year or less. Most participants were Caucasian (91.7%), two participants were biracial (5.6%), and one participant was Hispanic (2.8%). Most participants (80.6%) met diagnostic criteria for ADHD predominately inattentive subtype, and the remaining met diagnostic criteria for ADHD combined subtype. In addition, semistructured clinical interviews with the primary caregiver suggested that 16.7% of participants met diagnostic criteria for comorbid oppositional defiant disorder and another 5.6% met criteria for comorbid conduct disorder. Most participants (75.0%) had previously taken medications for ADHD, and half (50.0%) were using medications to treat ADHD symptoms at the time of intake. Medication status was monitored throughout treatment, and only four participants changed their medication during the study (1 discontinued medication and 3 began medication). One-third of the sample (33.3%) had previously received special education services in some capacity, and at the time of intake, one-quarter (25.0%) planned to continue such help during the study period.

Procedures

Recruitment: Recruitment flyers were mailed to the families of all students attending the two participating high schools 6 months prior to the start of the 2008–2009 school year. Respondents to these flyers were screened via telephone and those who indicated that their child exhibited at least four symptoms of inattention or reported that their child was previously diagnosed with ADHD were invited to a clinical evaluation conducted at a university-based clinic. The intake evaluations included psychoeducational testing of the adolescent, a semistructured diagnostic interview with a primary caregiver and the adolescent, and behavior rating scales collected from a primary caregiver and the adolescent. Intake evaluations started in late March 2008 and continued through September 2008, until all 36 participants were recruited.

Inclusion criteria required that participants (a) consented to participation; (b) attended one of the two participating schools; (c) anticipated 80% or more attendance at study activities; (d) met criteria for ADHD (any subtype) based on caregiver report in a semistructured clinical interview (Kiddie Schedule for Affective Disorders and Schizophrenia [K-SADS]; Kaufman

et al., 1997) or the parent version of the Disruptive Behavior Disorders Scale (DBD; Pelham, Gnagy, Greenslade, & Milich, 1992); (e) demonstrated a full-scale IQ over 80 as determined by the Kaufman Brief Intelligence Test-Second Edition (KBIT-2; Kaufman & Kaufman, 2004); (f) demonstrated evidence of functional impairment in at least two domains according to the parent report on the K-SADS or the parent version of the Impairment Rating Scale (IRS; scores ≥3) or indicated on the abbreviated version of the Wechsler Individual Achievement Test-Second Edition (WIAT-II; The Psychological Corporation, 2001); and (g) reported no history of illicit substance dependence, psychosis, obsessive–compulsive, or bipolar disorders (see Table 1). The intake evaluation took approximately 2.5 h and families were reimbursed $100. Eligibility for inclusion in the study required unanimous agreement between a licensed clinical child psychologist and a certified school psychologist that the above criteria were met in a diagnostic consensus conference (Leckman, Sholomskas, Thompson, Belanger, & Weissman, 1982).

Eligible participants were randomly assigned to either a treatment (n = 24) or a community control condition (n = 12), using a weighted 2:1 assignment ratio favoring the treatment condition and balanced across both school sites. Consistent with the goals of “partial effectiveness tests” of new interventions, the assignment was disproportionate to allow for the detailed evaluation of response to these interventions as reported in this manuscript. For the purposes of this manuscript, only data from the treatment group are included.

Treatment Group: Participants randomly assigned to the treatment group (n = 24) received school-based psychosocial interventions designed to address the academic and social impairments commonly experienced by adolescents with ADHD. Primarily, these interventions were delivered and coordinated by two bachelors-level former teachers (hereafter, *skills coaches*) who worked in the schools 18 h per week, under the supervision of a university-based, doctoral-level school psychologist. The skills coaches were trained to implement several psychosocial interventions adapted for high school students from treatment studies of middle school students with ADHD (Challenging Horizons Program) and described in a treatment manual. Interventions in the treatment manual included the organization intervention and ISG that are the focus of these studies along with other interventions. The skills coaches met with participants during regular school hours, typically in one-to-one meetings during class transitions, elective classes, study halls, or resource room time (where applicable). On average, these meetings lasted 22.1 min (SD = 13.6), and each participant met with the skills coach an average of 26.8 times (SD = 8.4) over the course of the school year.

In addition to the skills coaches meetings with adolescents, parents of participants were invited to a 10-session parent training group that met weekly at the schools during the fall. The parent training group was led by a doctoral-level school psychologist, and the goal was to assist parents in creating behavior contracts at home. Attendance at the weekly meetings ranged from 58 to 100% of the treatment families across all 10 weeks (M = 77%).

Organization Intervention—The organization intervention is grounded in operant learning theory, which indicates that consistent monitoring of behavior and application of contingencies using reinforcement and punishment will shape behavior over time with an

adequate number of pairings. The application of these principles will conceptually improve academic functioning if they are applied to the behavioral manifestations of disorganization that contribute to classroom performance. Organization standards most related to academic improvement in our studies of middle school youth with ADHD were organizational characteristics of the students' binders and assignment notebooks (Evans et al., 2009), and these were prioritized in this intervention.

To complete the organization intervention, coaches reviewed students' binders using the organization checklist and planner checklist during every individual meeting (see descriptions of checklists in "Process Measures" section). Coaches praised and rewarded adherence to the checklists and helped students correct errors in their systems of organization. Additionally, in a few instances where initial progress was limited, tangible rewards were provided as reinforcement for progress. Consistent with other behavioral techniques, this intervention included monitoring of the organization systems and contingencies for performance.

The coaches were trained to reliably complete the checklists and implement the procedures by a doctoral-level school psychologist who also provided their supervision. After completing practice checks, the coaches observed the supervisor completing the procedures with the students and received live supervision during their initial implementation of the procedures as well as during subsequent supervision session throughout the academic year.

Treatment Fidelity—Individual sessions between treatment participants and the skills coaches were audio-recorded, and a random sample of 75 recordings that captured either organization or social skill interventions was selected for analysis. Two trained undergraduate research assistants independently coded audio recordings of sessions for procedural adherence using checklists derived from the treatment manual. The average interrater agreement for sessions involving the organization intervention was 92.5% (SD = 7.0), and the average adherence rate on the organization intervention was 75.8% (SD = 16.3) of the planned procedures.

Dependent Measures—Mid-year evaluations were completed between January and March of the study year, and end-of-year evaluations were conducted between April and June, as family availability permitted. The instruments administered at these evaluations that are used in this evaluation of the organization intervention are briefly described below.

School Grades: Grades for each participant were collected directly from school counseling offices at both sites at the end of the school year. An overall grade point average (GPA) was created using grades for each of the four core courses (math, English, social studies, and science), where $A = 4.0$, $B = 3.0$, $C = 2.0$, $D = 1.0$, and $F = 0.0$.

Process Measures

Organization Checklist: The organization checklist is an 8-item measure that specifies how students are expected to organize their academic materials (e.g., binders, planner, class notes, and assignments). This checklist was originally developed for middle school students, and modifications were made for use in a high school that included adding options for

students to designate some storage locations for materials in the criteria. The criteria on the checklist were clearly defined (e.g., Is your binder free of loose and irrelevant materials) to ensure that the checklists were objective and required no subjective judgment on the part of the coaches when completing the ratings. Students received a “yes” next to the criteria if they adhered to the expectation and a “no” next to criteria that were not met. An overall organization score was calculated by determining the percentage of criteria that were met.

Planner Checklist: The planner checklist specifies how students are expected to record their assignments in their planner. There are 5 items about recording long-term assignments and 6 items about recording short-term assignments. The criteria on the checklist were clearly defined (e.g., Has a short-term project/assignment been recorded in the last week) to ensure that the checklists were objective and required no subjective judgment to complete. Students received a “yes” next to the criteria they adhered to and a “no” next to criteria that were not met. An overall planner score was calculated by determining the percentage of criteria that were met.

Results

The purpose of study one was to evaluate the relationship between the process measures and the outcomes for the organization intervention. Specifically, we evaluated whether mastery of the intervention was related to outcomes and the relationships between grades and both organization skills and planner accuracy.

Response to Organization Intervention—In assessing the organization intervention, the first aim was to determine whether high school students with ADHD improved their organization skills and planner accuracy over the course the year when the organization checklist and planner checklist interventions were implemented. This aim was achieved by assessing improvement in organization skills and planner accuracy using mastery criteria and effect sizes. We also calculated effect sizes (*d*) for standardized mean-change scores (Becker, 1988), representing the magnitude of the difference between the pretest and the posttest for each outcome. This method of calculating effect sizes takes into account the correlation of scores between phases (Lipsey & Wilson, 2001).

Improvement Based on Mastery: First, the number of participants who mastered each intervention and the amount of time it took them to achieve mastery was calculated. A criterion-referenced approach that was used in a similar study in middle school students (Evans et al., 2009) was employed. Mastery criteria were established because normative standards for mastery (e.g., normal range) may be misleading, as techniques that work for high school students without ADHD (e.g., just remembering their assignments) are insufficient for students with ADHD. As a result, maintaining this organization system for tracking assignments and organizing materials is a compensatory technique and probably unnecessary for most high school students. Mastery of the organization checklist and planner checklist was defined as meeting an average of 90% or more of the criteria for three consecutive weeks. On the organization checklist, 61.9% of participants achieved mastery criteria during the school year, with 69.2% of those participants achieving mastery on or before the ninth session, and the remaining 30.8% of those participants taking between 14

and 21 sessions to achieve mastery. On the planner checklist, 38.1% of participants achieved mastery criteria during the year, with 87.5% of those participants achieving mastery on or before the ninth session, and the remaining 12.5% taking at least 20 sessions to achieve mastery. These results indicate that within our sample, more students mastered the organization checklist than the planner checklist. Notably, it was observed that for both interventions, the majority of high school students in our sample who ever mastered the task did so in nine sessions (about 2 months). Additionally, medication status was investigated to determine whether medication may have played a role in treatment response. The portion of the year that each participant took medication for ADHD was recorded, and average percentages were calculated to analyze the potential impact of medication on treatment response. Participants who mastered the organization intervention were taking medication 31% of the time, while those who did not master the intervention were taking medication 71% of the time. For the planner checklist, participants who mastered the planner intervention were taking medication 42% of the time, and those who did not master the intervention were taking medication 47% of the time. Thus, participants who mastered the interventions were less likely to be on medication than those who did not.

Improvement Based on Effect Sizes: Effect sizes (*d*) were calculated as standardized mean-change scores (Becker, 1988), as a second indicator of improvement on the organization tasks. The average of scores over the first three sessions of both the organization checklist and planner checklist interventions was contrasted with the average of scores for the final three sessions prior to May. The final three scores prior to May were chosen because there was a notable decline in performance on the organization checklist and the planner checklist for the majority of students in May (see Fig. 1). This decline has been noted in previous studies of young adolescents with ADHD, and it has been suggested that when interpreting data for an entire school year, it is preferable to use data from March or April for end of treatment data points (Evans, Allen, Moore, & Strauss, 2005). Data from two participants for the organization checklist and from one participant for the planner checklist were removed for the effect size analyses because scores did not contain sufficient variability to calculate an effect size. Individuals with a moderate effect size of 0.45 or more were considered improvers (Lipsey, 1990). Seventy-nine percent of participants were improvers with the organization skills intervention, and there were 14 participants with large effect sizes (≥.9). Thirty-five percent of the participants were improvers, and 4 had large effect sizes for planner accuracy. The mean effect size for organization skills was 2.18 (SD = 2.10) and for planner accuracy was −0.74 (SD = 1.89). For organization skills, only four participants had effect sizes under 0.45 and two were negative; however, for planner accuracy 13 participants had effect sizes below 0.45 and 10 were negative. These results indicate that a majority of participants (79%) were able to improve their organization. Additionally, although some participants improved planner accuracy (35%), the response to this intervention was mixed as the performance of many students deteriorated.

Organization Intervention and Associated Outcomes—The second aim of the organization intervention was to assess the relationships between grades and both organization skills and planner accuracy. This aim was investigated by both looking at the relationship between average scores on the organization and planner checklists and GPA and

by evaluating the relationship between average scores over the year on each organization checklist item and GPA.

GPA was also examined in relation to mastery status; however, it was determined that there was no significant difference in GPA between participants who mastered the intervention and those who did not.

Organization Checklist and Planner Checklist Scores and GPA: Each participant's average scores on the organization checklist and planner checklist during the schools' six distinct grading periods were calculated. GPAs from each grading period were correlated with the average organization checklist and planner checklist scores for that grading period. Organization checklist and planner checklist performance scores were not normally distributed; thus, in order to provide conservative estimates, Kendall's tau-*b* was used for the calculations (Field, 2005). The correlations between GPA and the organization checklist at each grading period are as follows: grading period 1 ($r = 0.153$), grading period 2 ($r = 0.269$*), grading period 3 ($r = 0.054$), grading period 4 ($r = 0.064$), grading period 5 ($r = 0.313$*), and grading period 6 ($r = 0.305$*). The correlations between GPA and the planner checklist at each grading period are as follows: grading period 1 ($r = -0.276$), grading period 2 ($r = 0.0.255$), grading period 3 ($r = 0.302$*), grading period 4 ($r = -0.054$), grading period 5 ($r = 0.010$), and grading period 6 ($r = 0.136$). Therefore, there were significant correlations between organization checklist scores and GPA during grading periods two, five, and six and between planner checklist scores and GPA only during grading period 2.

Organization Checklist Items and GPA: The relationship between specific organization checklist items and GPA was examined by correlating GPA from grading period five with each participant's average over the year on each item. Grading period five was chosen because it was close to the end of the school year; thus, the students had a maximum amount of time receiving the intervention prior to the May decline. The organization checklist items that asked about having a planner, if their planner was free of loose papers, and the overall organization checklist score were most strongly related to GPA (see Table 2). Although all correlations were positive, the others were small and suggest minimal association.

Discussion

Organization Intervention—Results from the organization intervention indicate that the majority (61.9%) of high school students with ADHD responded to the organization intervention and approximately 40% responded to the planner intervention. Seven students achieved mastery of both the organization intervention and the planner intervention, six students mastered the organization intervention only, one student mastered the planner intervention only, and seven students did not master either intervention. Interestingly, participants who did not master the interventions were more likely to be taking medication and taking medication over a longer period of time than participants who mastered the interventions. This may be because participants with greater problem severity were more likely to be taking medication, and these are the same participants who were less responsive to the interventions.

In this study, the majority of students (69.2%) who achieved mastery of the organization intervention did so by the ninth session. As the definition of mastery required maintenance of 90% or better over 3 weeks, these students appear to have received an adequate number of pairings of behavior and contingencies after 6 weeks to achieve mastery. The remaining 30.8% of those students who achieved mastery took between 14 and 21 sessions to achieve mastery, and 38.1% of the sample never achieved mastery. These findings suggest that in future studies, it may be beneficial to increase the frequency of meetings with those students who do not achieve mastery by the tenth session. Furthermore, the finding that there was no meaningful pattern of differences in GPA between participants who mastered the organization intervention and those who did not, in spite of correlations between the items and grades, suggests that our mastery threshold may not be clinically meaningful and need to be increased.

Results of these tests with the organization intervention indicated that the relationship between the overall organization checklist score and GPA was significant, and the relationship between average scores over the year on each organization item was always in the positive direction (see Table 2). However, despite the positive relationship between performance on the organization checklist and grades, the magnitude of the correlations was relatively small (accounting for approximately 9% of the variance in grades) and inconsistent. In slightly larger studies reporting analyses based on middle school students, teacher ratings of organization accounted for between 9 and 25% of the variance in grades (Evans et al., 2009; Langberg et al., 2011). Given the serious risk for receiving failing grades by adolescents with ADHD (Schultz, Evans, & Serpell, 2009), an easy to administer quick intervention such as this one that accounts for 9% or more of the variance in grades may be quite valuable. However, the inconsistent findings suggest that modifications may be needed for some of the items and an increase in the frequency of monitoring may be needed to maximize its impact.

Unlike the results of the organization intervention, the findings related to the planner checklist were inconsistent and appear to be minimally related to outcomes. Given the significant relationship between grades and the organization checklist item pertaining to having a planner and having it free from irrelevant materials, it is surprising that planner checklist scores were not more strongly and consistently associated with GPA. The lack of a relationship between planner checklist scores and GPA may be due to frequent scores of zero on the planner checklist for some students. In addition, teachers vary in the degree with which homework contributes to grades in the course. Finally, our procedures for confirming the accuracy of the assignments recorded in the planner may have been inadequate. If the accuracy of assignments recorded in the planner is inconsistent, then the relationship between the recording of assignments and grades is likely to be poor. These results suggest that establishing methods to verify the accuracy of assignments may be needed to improve the benefits of this intervention. In addition, the intervention may need to be extended to include the tracking of assignments submitted to teachers, so records of whether an assignment was recorded in the planner and completed could be compared to better capture the entire homework completion process.

As noted earlier, our findings replicated previous work documenting a decline in performance at the end of the academic year. The vast majority of students exhibited a decline in their performance on the organization checklist during the month of May. Based on our observations and discussions with teachers, this decline may be primarily attributable to changes in the activities and expectations of classes during this month. Following the administration of the state standardized tests, many teachers reduced the number of assignments, decreased their amount of instruction, and increased the frequency of minimally demanding class activities (e.g., showing movies, playing games) compared with the rest of the year. As a result, there was less need for students to be organized during this time period, and many students appear to have discontinued efforts to do so. A similar decline in performance in May, evidenced by increased ADHD symptoms and impairment after making progress during the school year, was seen in a study of an afterschool intervention program for middle school students with ADHD (Evans et al., 2005). Our findings support the suggestion by Evans et al. (2005) that when interpreting data for treatment outcome studies spanning the full academic year, data from March or April–may be preferable to May for the end of treatment assessments.

Study 2

Method

Participants—Although 24 participants attended at least one session of ISG, only participants who attended 80% of the evening ISG sessions were included in study two (n = 15).

Interpersonal Skills Group—Concurrent with the weekly parent meetings, adolescents participated in ISG. In ISG, the behavioral principles are not applied to specific social skills, but instead applied to social cognitive processes and related behaviors that are thought to underlie the social impairment associated with individuals with ADHD. In particular, this intervention is based on the findings by Lorch and colleagues (e.g., Lorch, Milich, Astrin, & Berthiaume, 2006) that indicate that children with ADHD do not comprehend cause and effect relationships in social situations as well as youth without ADHD. Moreover, this difficulty comprehending interpersonal cause and effect relationships is related to overall social functioning (Sibley, Evans, & Serpell, 2010). As a result, our group intervention helps participants understand the relationship between their behavior and the reactions of others and the impressions others form of them.

The ten ISG group meetings were led by a graduate student and supported by several undergraduate psychology students and staff. Adolescent attendance rates at the ISG meetings ranged from 50 to 91% of adolescent participants (M = 70%). In weeks one and two, participants learned problem-solving steps and vocabulary words related to the intervention. Additionally, adolescents worked with staff to generate individualized ideal self goals. Participants' goals were impressions that the participants wanted others to have of them and included objectives such as "being seen as funny," "being seen as smart," and "being seen as nice." In subsequent ISG meetings, participants interacted with the other participants in the group in various semistructured activities (e.g., sports, board games) and free time. At regular intervals throughout the session, participants were individually pulled

from these activities to rate their performance on their ideal self goals using a seven-point scale ranging from −3 to +3. Negative and positive numbers on the scale represented the degree to which the student's behavior in the observed interval was likely to change others' impressions of him/her in a manner consistent with the student's ideal self goals. After the participant and staff member rated the participant's behavior, they shared their ratings and engaged in a discussion about the specific behaviors that led to the ratings. During these discussions, staff members and participants focused on interpreting the feedback of other participants in response to the participant's social behavior and using this information to inform modifications in the adolescent's behavior for the next interval. These discussions were designed to help participants identify the cause and effect relationships between their behavior and the impressions of others. Participants and staff members identified specific steps the adolescent could take to increase the likelihood that subsequent behavior would help the student achieve the ideal self goals. After this discussion, the adolescent returned to the activity until the next feedback session.

Treatment Fidelity—Staff completed training on the ISG procedures and the graduate student leading the groups received weekly supervision including the observation of some group sessions. During the ten ISG meetings, staff ratings of student performance on individual goals were compared with that of the group leader on 477 occasions. In these comparisons, absolute agreement was achieved in 76.1% of cases, and in 98.3% of cases, the ratings were within 1 point of each other.

Dependent Measures

Impairment Rating Scale (IRS: Fabiano et al., 2006): The parent version of the IRS is a brief rating scale that assesses several broad areas of impairment, including academic impairment, social impairment, and impairment in adult–child relationships. Most IRS items are scored along a seven-point scale, anchored by *No Problem, Definitely does not need treatment and Extreme Problem, Definitely needs treatment*. The IRS has been found to be sensitive to treatment-related changes, with good test–retest reliability (r = 0.74–0.96) and good convergent and discriminant validity (PPP = 0.90; NPP = 0.74). Further, IRS scores have moderate to high correlations when compared with other teacher instruments that measure impairment (Fabiano et al., 2006). In the present study, we used the item designed to measure social impairment.

Social Skills Rating System (SSRS; Gresham & Elliott, 1990): The SSRS is a parent and self-report standardized measure of social functioning. It has 40 social skills items and 12 items assessing problem behaviors. Items are rated on a 3-point Likert response format ranging from *Never* to *Often*, with higher scores indicating better social skills. Scoring included a total score, which is the sum of all item responses, and three subscales that include social skills, internalizing behavior problems, and externalizing behavior problems. Standardized scores of the parent version of this measure and ranged from scores of 40–130 with a standard deviation of 10. Norms and information on the standardization sample reveal acceptable psychometric properties. The SSRS has good test–retest reliability (r = 0.84–0.93; Gresham & Elliott, 1990) and evidence of moderate to high convergent validity with

other measures of social competence (Flanagan, Alfonso, Primavera, Povall, & Higgins, 1996). The social skills subscale was used in this study.

Process Measures

ISG Card: Staff Version: Staff members observed and rated the social behavior of students while they interacted with peers during the ISG practice activities (3× per session). Staff members used the ISG Scoring Rubric to rate the social behavior of adolescents on a scale of −3 to +3 with −3 indicating behavior that is likely to lead to an impression by others that is opposite the ideal self goal (e.g., student interrupts frequently and has goal of being seen as respectful of others). A rating of +3 indicates that the behavior exhibited during the interval was likely to enhance the impression of others in a manner consistent with the goal. A rating of 0 was a neutral score meaning “No evidence either way”. Both the student’s behavior and the reactions of others in the group were used to determine the ratings.

ISG Card: Adolescent Version: Adolescent perceptions of their own social behavior were assessed during ISG. Adolescents rated their behaviors during the intervals of the ISG activities using the same ISG Scoring Rubric as the staff members. Adolescents were to consider their behavior and the reactions of others in the group when making their ratings. They rated themselves an average of three times during each ISG meeting.

Results

The primary aims for this study involved examining the participants’ response to the interventions and evaluating whether mastering the intervention predicted better performance on outcome measures of social functioning.

Response to Interpersonal Skills Group—In assessing the social functioning intervention, the first aim was to determine whether staff ratings of behavior indicated improvement in behavior consistent with ideal self goals during the ISG. Students were considered to have achieved mastery of the intervention if they achieved an average score of 2 or greater on staff ratings of at least one of their ideal self goals for three consecutive ISG sessions. These scores were chosen as they indicate that the students’ behavior portrayed the desired goal more than just a little.

Five of the fifteen participants (33%) achieved mastery criteria for one of their ideal self goals, with one of these five participants achieving mastery criteria for two ideal self goals. Ten of the fifteen participants (66%) did not achieve mastery criteria. It took participants who mastered their ideal self goals between five and eight sessions to achieve mastery criteria, with an average time to mastery of 6.5 sessions. Some (20%) of the participants had achieved mastery criteria for two consecutive sessions so they may have achieved mastery had there been one more session. Medication status was investigated using the same methods as described previously in the organization intervention results section to determine whether medication may have played a role in achieving mastery. Participants who mastered ISG were taking medication approximately 20% of the time, while those who did not master ISG were taking medication 53% of the time. Thus, participants who mastered the

intervention were less likely to be taking medication than those who did not master the intervention.

Interpersonal Skills Group and Associated Outcomes—In addition to examining response to the ISG intervention and rate of mastery, we also evaluated whether mastering the ISG intervention predicted better performance on outcome measures of social functioning compared to scores from students who did not master the intervention. To address this aim, effect sizes of the social functioning outcome variable, as measured by standardized mean-change scores (*d*; Becker, 1988), were calculated for participants who achieved mastery and for those who did not achieve mastery of the intervention. Effect sizes were calculated at baseline and immediately following the end of ISG sessions using the scores from the SSRS and IRS.

Social Skills Rating System Outcomes: Mean scores on the SSRS for participants who mastered goals ($n = 5$) were $M = 11.40$ (baseline) and $M = 12.60$ (end of treatment), with a small to moderate effect size of $d = -0.32$. For those who did not master goals ($n = 10$), the mean score on the SSRS at baseline was $M = 11.90$ and end of treatment was $M = 12.40$ ($d = -0.11$). These results indicate that participants who mastered and those who did not master ISG goals had equivalent small to moderate increases in social skills from baseline to the end of ISG.

Impairment Rating Scale: Mean scores on the social functioning question of the IRS at baseline and end of treatment for those achieving mastery ($n = 5$) were $M = 3.20$ (baseline) and $M = 1.20$ (end of treatment), with a moderate effect size of $d = 0.59$. For those not achieving mastery ($n = 10$), mean scores on the IRS at baseline were $M = 3.60$ and end of treatment was $M = 2.90$, with a medium effect size of $d = 0.36$. These results indicate that at the end of ISG sessions, participants who mastered the intervention had moderate decreases in social impairment, while participants who did not master the intervention had small to moderate decreases in social impairment. Therefore, students who mastered at least one of their ideal self goals had the greatest improvement in social functioning and those who participated in the intervention but did not master at least one goal made smaller improvements (see Fig. 2).

Discussion

The aims of the social functioning intervention included examining the response to the ISG and determining whether mastering the ISG intervention predicted better performance on outcome measures of social functioning compared with not mastering the intervention. Unlike the organization intervention, less than half of the participants met mastery criteria (33%). The average time to mastery was 6.5 sessions, and because mastery required demonstrating competence over three sessions, the average responder was performing well after only three sessions. Inconsistent performance was the norm for many of the others, and as noted previously, a few may have been able to achieve mastery had the group continued for at least one more session. Given this trend, future studies of the ISG with high school–aged students should continue beyond ten sessions to allow more students to have a chance to achieve the stability in competent performance necessary to achieve the mastery criteria.

Similar to the organization intervention, participants who did not master ISG were more likely to be taking medications and taking medications for a longer amount of time than participants who mastered the intervention. As noted previously, taking medication may have been a marker for severity and thus the minimal response to the ISG intervention.

We examined the relationship between our outcome measures of social functioning and our proximal measure of response to the ISG intervention. Although there were group differences in the anticipated direction using parent ratings on the IRS, these differences did not exist with parent ratings on the SSRS. These two measures are very different from each other with the IRS score resulting from a parent's response to one item and the SSRS includes parent ratings of 40 social skills items. It may be that the SSRS includes many facets of social functioning and only a few of them may be important to parents or sensitive to change. In fact, a recent study by Gresham et al. (2010) reported that a small subset of items on this measure appear to be most sensitive to responses to interventions. Our findings in this study are consistent with others we have reported with middle school youth that have revealed a response to interventions targeting social functioning using the IRS, but not the SSRS (Evans et al., 2007). Future studies should include the IRS and may consider using the short version of the SSRS that has been proposed by Gresham and colleagues to measure response.

Parents of adolescents in the mastery and nonmastery group rated the social impairment of their adolescents on the IRS as decreasing from the beginning to the end of treatment. In terms of magnitude of change from the beginning of treatment to the end of treatment, parent-reported social impairment of adolescents in the mastery condition decreased an average of two full points on a 7-point Likert-type response format measuring social impairment. Parent-reported social impairment of adolescents in the nonmastery condition decreased almost one full point on a 7-point Likert-type response format measuring social impairment. The scores for both groups moved from the impaired range on the IRS (≥3) to the nonimpaired range (<3). Although adolescents in the mastery and nonmastery groups were equivalently impaired at baseline, adolescents in the mastery condition were less impaired than participants in the nonmastery condition at posttreatment (see Fig. 2). Despite the small sample size and other limitations, this finding suggests that participants' improvement on the skills taught in the intervention may be associated with overall social functioning. Given the lack of evidence in the literature for interventions that improve the social functioning of youth with ADHD, this finding is especially encouraging. A behavioral approach to training the social cognitive mechanisms that may underlie social impairment in youth with ADHD (Lorch et al., 2006; Sibley et al., 2010) may be an effective approach to treatment development.

General Discussion

Main Findings

The purposes of the present studies are to evaluate response to the organization and social functioning interventions and determine the strength of relationship between proximal measures of response and related outcome measures. The majority of participants demonstrated an improvement to mastery on the organization intervention, and there was

preliminary support for a relationship between performance on the organization checklist and grades. These findings suggest that the organization intervention may be targeting skills integrally related to achieving good grades in high school for youth with ADHD. However, the response to the planner checklist intervention and the relationship between performance on this intervention and grades was inconsistent and indicates that this intervention may need modifications for it to be meaningfully effective. Results from the ISG intervention indicated that many participants were not able to achieve mastery of the targeted skills within ten sessions; however, our findings suggest that for those who did achieve success on the proximal measures, there was a notable improvement in overall social functioning.

Limitations

There are several limitations of this study that should be considered when interpreting results; however, they should be interpreted within the context of the purpose of the study. This study was conducted to identify implications for further research and was not intended to determine the efficacy of these interventions with this population. The small sample size restricted our analytical options and limited our confidence in the findings. The lack of racial and ethnic diversity in our sample (92% Caucasian) raises the possibility that differences in response to these interventions may exist between races and cultures; however, there is little indication in the treatment literature that these are likely to moderate response. Teacher ratings of symptoms and impairment were not used in this study to diagnose participants with ADHD. Although parent report of symptoms and impairment were used, teacher ratings of school impairment may have enhanced diagnostic accuracy. The organization ratings were dichotomous and provided little room for subjective judgment; however, confidence in our findings may have been improved with measures of reliability of these ratings. The low attendance rates at the ISG meetings were also problematic because it decreased an already small sample size. Only 15 (62.5%) of the adolescents attended at least eight of the ten ISG sessions. Attending at least eight out of ten sessions was used as criterion for inclusion in the analyses because attendance at less than eight sessions would compromise our ability to analyze time to mastery difficult. It is possible that the 15 students included in the analyses may have been unique in some manner that may have contributed to their response to the intervention. Finally, although medication status was monitored throughout treatment, there may have been changes in medication that contributed to intervention response, but were not accounted for by in our analyses of medication effects. These may have included changes in medication dosage and changes in type of medication; therefore, further investigation of medication effects is warranted.

Future Directions

Treatment development is an iterative process, and the examination of the data at each stage should inform modifications to the interventions and procedures at subsequent stages. The results of these studies are not adequate to suggest that the studied interventions should be considered effective, but they do provide implications for modifications to the measures and intervention procedures in future research. In addition, they do suggest that the organization intervention and ISG warrant additional study as proximal measures of the specific skills being taught were related to the distal outcome measures of academic and social functioning.

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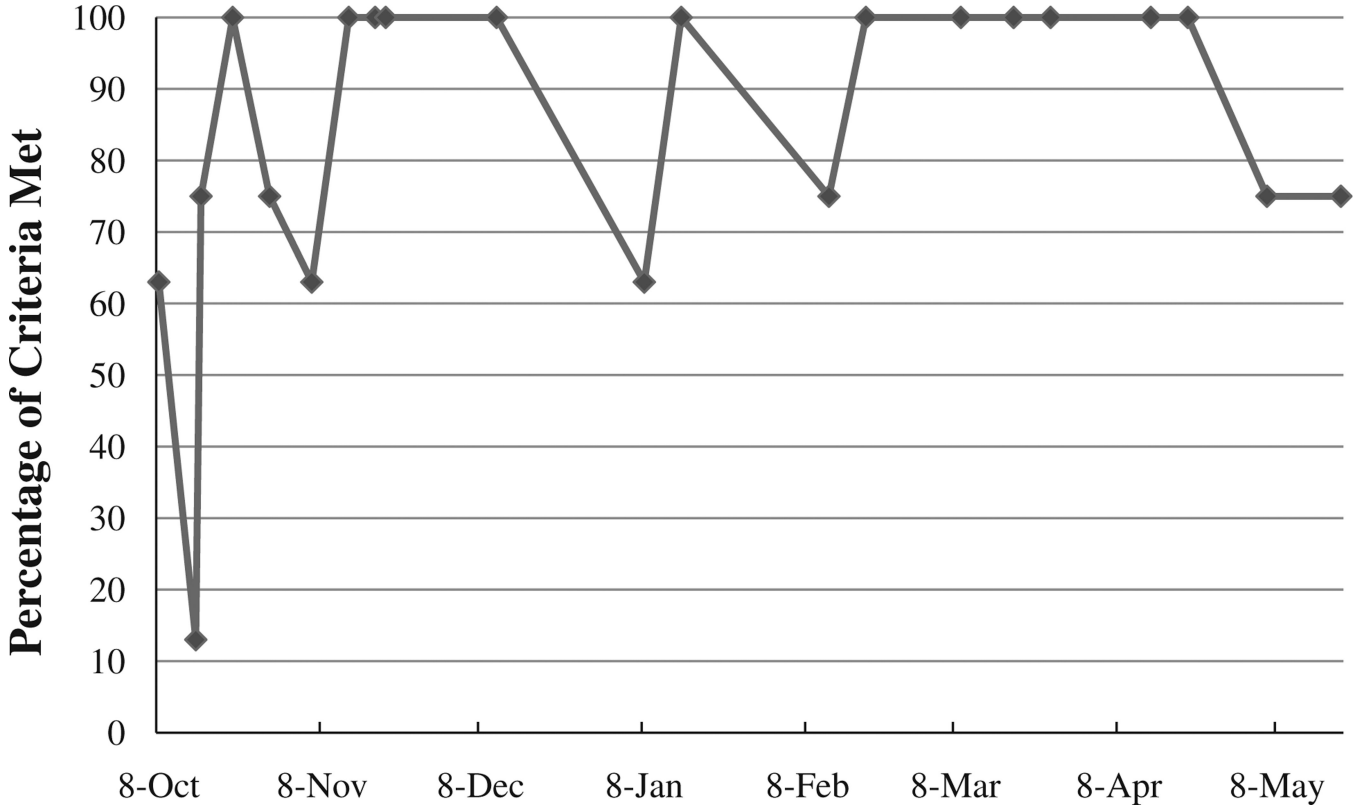

Fig. 1.
Sample data from a participant who met mastery criteria in March and declined in May

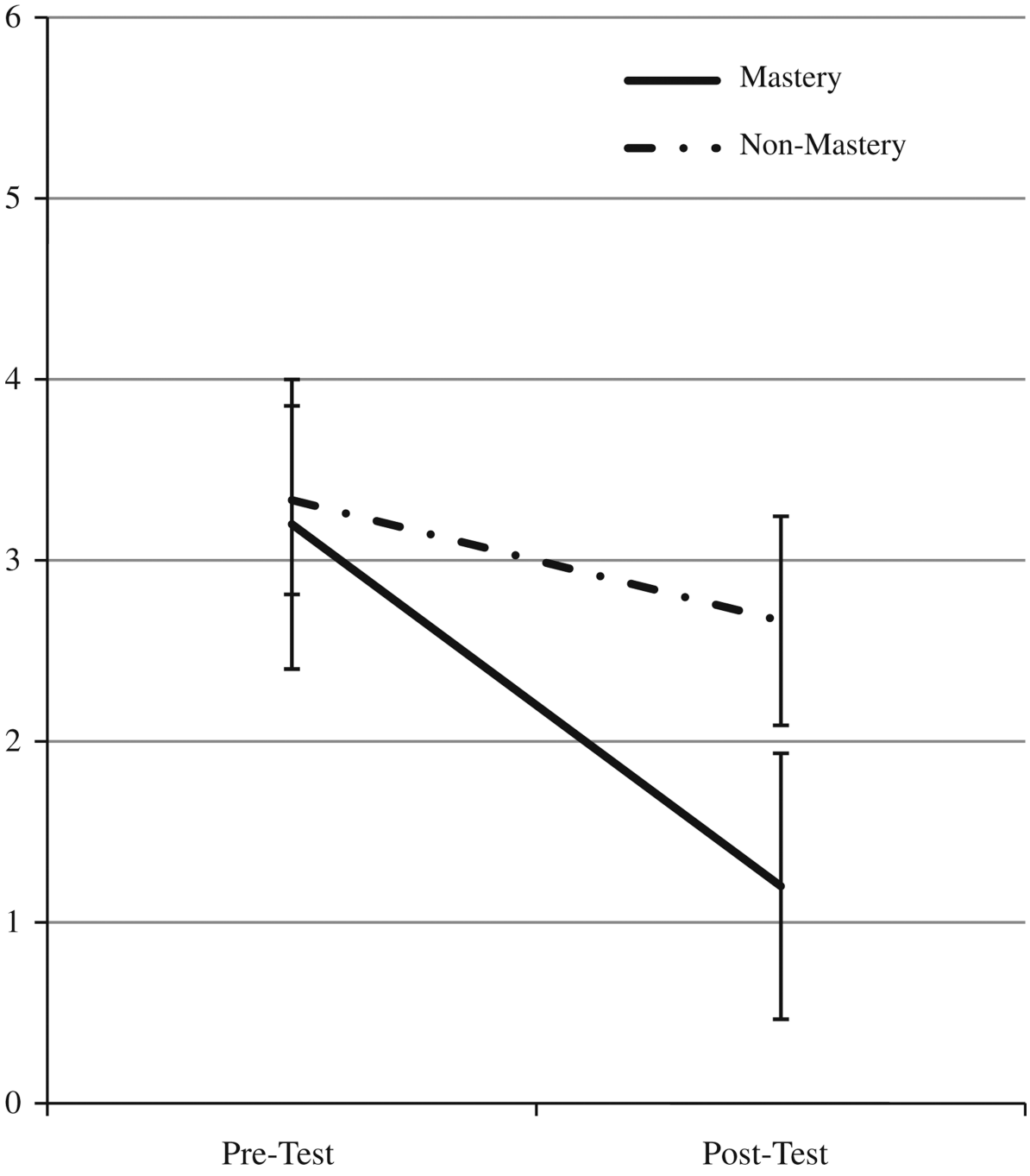

Fig. 2.
Mastery and nonmastery scores on social impairment measured by the Impairment Rating Scale

Table 1

Participant diagnostic, IQ, and achievement data at intake

	Treatment Group (*n* = 24)			
	M	**SD**	**Min**	**Max**
Diagnosis (symptom counts)				
ADHD inattention	7.8	1.2	6	9
ADHD hyperimpulsivity	3.8	2.9	0	9
ODD	1.9	2.4	0	8
CD	0.5	1.3	0	6
IQ/achievement				
KBIT-2 full-scale IQ	105.5	12.4	83	120
WIAT-II reading	104.4	15.4	71	124
WIAT-II num oper	96.6	18.6	49	126
WIAT-II spelling	101.3	13.0	71	119
WIAT-II writ exp	102.6	11.6	81	126

Diagnostic data were provided by primary caregiver during semistructured clinical interview (K-SADS) with a trained clinician. *KBIT-2* Kaufman Brief Intelligence Test-Second Edition, *WIAT-II* Wechsler Individual Achievement Test-Second Edition, *reading* reading subtest, *num oper* numerical operations subtest, *spelling* spelling subtest, *writ exp* written expression subtest

Table 2

Correlations between average organization checklist performance and grades

Items	Grades from period 5 GPA (n = 20)
Do you have the correct binders for today (i.e., even binders on even day and odd binders on odd day)?	.253
Are your binders free from loose and irrelevant material (e.g., nonsubject related material)?	.170
Is your planner present?	.419*
Is your planner free of loose and irrelevant material?	.419*
Inside your binders: are there *clearly defined* locations for storing incomplete assignments? "I keep them_____"	.149
Inside your binders: are there *clearly defined* locations for storing completed assignments (i.e., those assignments ready to be turned in.)? "I keep them_____"	.156
Inside the binders: are there clearly defined locations for storing all other class papers (e.g., graded assignments, class notes, class handouts)? "I keep then in_____"	.140
Is there a *clearly defined* **central** location for recording **all** long-term projects for each subject? "I record them in _____ "	.197
Overall performance on the organization checklist	.351*

Kendall's tau-*b* was used to calculate the correlations because the organization data were not normally distributed;

* $p < 0.05$; one-tailed test