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Overcoming the Research-to-Practice Gap: A Randomized Trial With Two Brief Homework and Organization Interventions for Students With ADHD as Implemented by School Mental Health Providers

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Objective: To evaluate the effectiveness of 2 brief school-based interventions targeting the homework problems of adolescents with attention-deficit/hyperactivity disorder (ADHD)—the Homework, Organization, and Planning Skills (HOPS) intervention and the Completing Homework by Improving Efficiency and Focus (CHIEF) intervention, as implemented by school mental health providers during the school day. A secondary goal was to use moderator analyses to identify student characteristics that may differentially predict intervention response. **Method:** Two-hundred and eighty middle school students with ADHD were randomized to the HOPS or CHIEF interventions or to waitlist, and parent and teacher ratings were collected pre, post, and at a 6-month follow-up. **Results:** Both interventions were implemented with fidelity by school mental health providers. Participants were pulled from elective periods and sessions averaged less than 20 min. Participants in HOPS and CHIEF demonstrated significantly greater improvements in comparison with waitlist on parent ratings of homework problems and organizational skills and effect sizes were large. HOPS participants also demonstrated moderate effect size improvements on materials management and organized action behaviors according to teachers. HOPS participants made significantly greater improvements in parent- and teacher-rated use of organized actions in comparison with CHIEF, but not on measures of homework problems. Moderation analyses revealed that participants with more severe psychopathology and behavioral dysregulation did significantly better with the HOPS intervention as compared to the CHIEF intervention. **Conclusions:** Brief school-based interventions implemented by school providers can be effective. This type of service delivery model may facilitate overcoming the oft cited research-to-practice gap.

What is the public health significance of this article?

This study demonstrates that research developed interventions for youth with ADHD can be implemented in real world settings with integrity by typically trained school mental health providers. These interventions can be used to improve the homework and organization difficulties commonly experienced by youth with ADHD.

Keywords: organizational skills, HOPS intervention, adolescents, school, homework

Attention-deficit/hyperactivity disorder (ADHD) is one of the most prevalent childhood mental health disorders (Thomas et al., 2015) and is associated with significant academic impairment, including low and failing grades and high rates of school dropout (Frazier, Youngstrom, Glutting, & Watkins, 2007; Kent et al., 2011; Kuriyan et al., 2013). The long-term connection between ADHD symptoms and negative outcomes such as delinquency is largely mediated by low academic achievement (Defoe, Farrington, &

Loeber, 2013), highlighting the importance of addressing academic impairment in this population. Academic impairment in youth with ADHD is often the result of problems managing and completing homework (Coghill et al., 2008; DuPaul & Langberg, 2014), which is a major part of the educational curriculum in the United States (Cooper, Robinson, & Patall, 2006; U.S. Department of Education, 2008). Students with ADHD often fail to record assignments, lose materials, procrastinate, and have difficulty completing work effi-

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ciently (Boyer, Geurts, & Van der Oord, 2015; Power, Werba, Watkins, Angelucci, & Eiraldi, 2006). Overall, students with ADHD turn in approximately 15%–25% fewer homework assignments each semester in comparison with their peers (Kent et al., 2011; Langberg et al., 2016). Homework problems are highly predictive of academic success, with parent-rated homework problems in elementary school predicting grade point average (GPA) in high school above and beyond intelligence and ADHD medication use (Langberg, Molina, et al., 2011).

Given the prevalence and persistence of problems with homework, organization, and planning in students with ADHD, multiple interventions have been developed to address these difficulties. Interventions have been designed for implementation in clinic settings (Abikoff et al., 2013; Boyer, Geurts, Prins, & Van der Oord, 2015; Sibley et al., 2016), school-settings (Evans et al., 2016; Pfiffner et al., 2016; Power et al., 2012; Sibley, Olson, Morley, Campez, & Pelham, 2016), and delivered across multiple settings, such as clinic and summer program (Merrill et al., 2017). Overall, these interventions are associated with impressive effects on measures of homework problems (e.g., Merrill et al., 2017; Cohens *ds* from 1.40–2.21) and organization and planning skills (e.g., Abikoff et al., 2013; Cohen's *ds* from 1.18–2.77) as compared with waitlist control groups. Indeed, a recent meta-analysis of interventions targeting the organizational skills of students with ADHD ($N = 12$ studies with 1,054 children) found these interventions lead to large effects on parent ratings and moderate effects on teacher ratings (Bikic et al., 2016). Multiple studies have also shown that these interventions are more effective than ADHD medication for homework problems (e.g., Langberg, Arnold, Flowers, Epstein, et al., 2010; Merrill et al., 2017).

Despite compelling evidence for the efficacy of interventions targeting the homework, organization, and planning problems of youth with ADHD, these programs have not been widely implemented in school or community settings. This problem is not unique to the field of ADHD, as evidence-based mental health treatments are not regularly incorporated into everyday school or clinical practice (Aarons et al., 2011; McHugh & Barlow, 2010; Novins, Green, Legha, & Aarons, 2013; Weisz, Ugueto, Cheron, & Herren, 2013). This discrepancy is often referred to as the research-to-practice gap. Three barriers to dissemination and implementation are repeatedly cited in articles discussing the research-to-practice gap (Weisz et al., 2013). First, interventions are often evaluated in clinic settings with samples that are highly educated, have high incomes, and lack diversity. Participants in these samples are frequently less severe in terms of psychopathology and broader issues such as parent stress (e.g., Ehrenreich-May et al., 2011; Southam-Gerow, Chorpita, Miller, & Gleacher, 2008). Further, research participants are actively recruited, and are often motivated to engage in treatment (Weisz et al., 2013). In contrast, community clinics and schools primarily treat youth who have been referred to treatment, and who may not be motivated to participate. As such, interventions developed and evaluated in research may not work well when applied in community and school settings.

Second, evidence-based interventions are frequently implemented by highly educated, trained, and supervised research staff. Research clinicians often have completely different training backgrounds and skill-sets in comparison with the practitioners for

whom the intervention is intended (Herschell, Kolko, Baumann, & Davis, 2010; McHugh & Barlow, 2010; Weisz et al., 2013). As such, it is not surprising that problems with fidelity and integrity are common when research-developed interventions are implemented in clinical or school settings (McLeod, Southam-Gerow, Tully, Rodriguez, & Smith, 2013; Southam-Gerow & McLeod, 2013). Indeed, very little is known about the efficacy of evidence-based practices implemented in schools by typically trained school mental health (SMH) providers (Owens et al., 2014).

A third commonly cited barrier to implementation is that evidence-based interventions use service delivery models which are not feasible in school and community contexts with typically available resources (Lyon, Ludwig, et al., 2014; Weisz et al., 2013). This is sometimes referred to as poor “fit” between the intervention delivery model and the school or community setting (Durlak & DuPre, 2008; Lyon, Ludwig, et al., 2014). Oftentimes, evidence-based interventions take the “kitchen sink” approach in that many theoretically sound treatment components are incorporated at the expense of increased implementation burden and complexity. For example, in school settings, a high degree of parent involvement is ideal (Castro et al., 2015), but engaging parents in 8- to 12-week group programs is often not feasible for schools (Stormshak et al., 2016) and school clinicians frequently lack the training needed to implement these types of programs (George, McDaniel, Michael, & Weist, 2014; Lever, Lindsey, O'Brennan, & Weist, 2014). In summary, all three barriers are significant, and have resulted in limited use of evidence-based intervention practices in school and community settings, or in interventions being implemented in those settings but with low fidelity and integrity.

These three barriers are therefore important to address in any efforts to improve the homework problems of students with ADHD. The homework problems students with ADHD exhibit are complex and increase in severity across development (Evans, Langberg, Egan, & Molitor, 2014; Wolraich et al., 2005). However, fully addressing homework problems must be balanced with ensuring that the interventions are feasible to implement in typical school settings. The homework completion cycle presented in Figure 1 demonstrates the complexity of the homework process and provides a framework for considering what specific behaviors homework interventions need to address.

As can be seen in Figure 1, to be successful with homework, a student must be able complete multiple organization and planning related tasks (circles 1, 2, 3, 4, and 6). In addition, there is an important behavioral component to homework completion, as students need to be able to concentrate and complete work efficiently (circle 5). Despite being defined as a single disorder, there is considerable behavioral heterogeneity within ADHD. For example, for some youth, hyperactive and impulsive behaviors persist into adolescence, whereas for others, those symptoms largely remit (Biederman et al., 2010; Larsson, Dilshad, Lichtenstein, & Barke, 2011). Similarly, there is significant heterogeneity in the executive functioning (EF) of individuals with ADHD. Not all individuals with ADHD experience significant problems with EF and for those that do, the specific patterns of deficits vary (e.g., working memory vs. organization and planning v. inhibition; Wahlstedt, Thorell, & Bohlin, 2009; Willcutt et al., 2005). Given this behavioral heterogeneity, it is not surprising that there is also variability in the aspects of the homework completion cycle that are most problem-

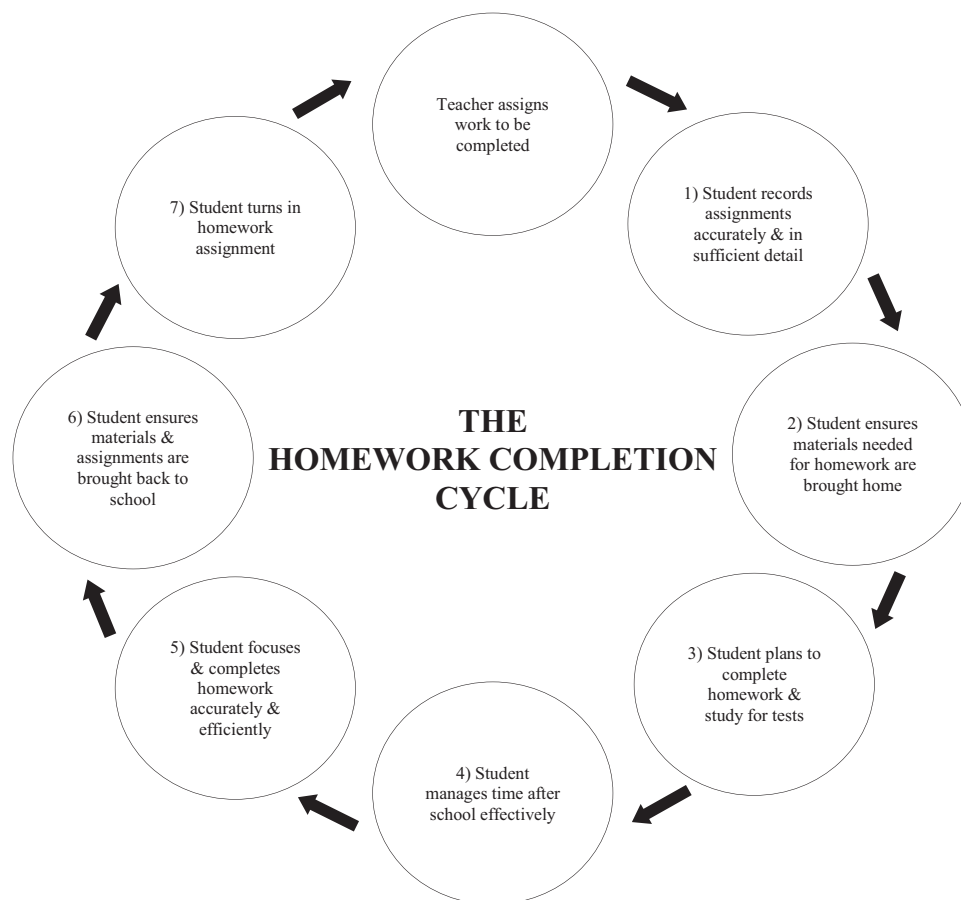


Figure 1. Homework completion cycle.

atic for students with ADHD. For example, some adolescents have considerable difficulty focusing during homework completion, make careless mistakes and take significantly longer than expected to complete work (Sibley et al., 2014, 2016). For other adolescents, the act of completing homework is not problematic, but they have difficulty with the EF-related organization and planning aspects of homework. For example, they are less likely to record homework assignments accurately or develop a plan for the completion of homework and tests, and they are more likely to lose materials in comparison with their peers (Langberg, Vaughn, et al., 2011; Sibley et al., 2016). Accordingly, homework interventions are needed that address multiple areas of difficulty.

The Homework, Organization, and Planning Skills (HOPS) intervention was designed to address the organization and planning aspects of the homework completion cycle (circles 1, 2, 3, 4, and 6). Further, it was designed to overcome the three barriers to dissemination and implementation cited above. Specifically, the HOPS intervention was developed using the Deployment Focused Model of treatment development and testing (Weisz, Jensen, & McLeod, 2005), which starts with the collection of expert opinion through focus groups with key stakeholders (Lyon, Bruns, et al., 2014). The HOPS intervention was designed to be implemented in school settings by SMH providers without ongoing coaching or supervision. The intervention was also designed to be brief. It

consists of 16 meetings between the student and SMH provider, with each meeting lasting 20 min or less, and the full intervention is completed in less than one school semester. Based upon feedback from school staff regarding feasibility (Langberg, Vaughn, et al., 2011), the HOPS intervention is implemented during the school day (students are pulled from elective periods) and includes only two meetings with parents. To date, this model of the HOPS intervention has been evaluated in a small randomized trial (total $N = 47$) as compared with a waitlist control (Langberg et al., 2012). Participants in the intervention demonstrated significantly greater improvements in comparison with waitlist on parent ratings of homework problems, organization, and planning (Cohen's $d_s = .7-.8$) but did not on teacher ratings.

As noted above, the HOPS intervention does not address circle 5 of the homework completion cycle (focus during work completion and completing work accurately and efficiently), which is a significant problem for many adolescents with ADHD and their families. Accordingly, the Completing Homework by Improving Efficiency and Focus (CHIEF) intervention was developed to address the more behavioral aspects of homework completion. Clinically, the comparison is important because it is possible that some middle school students with ADHD do not need skills instruction (i.e., HOPS) but instead, would benefit from schools providing consistent and highly structured periods for homework

completion, along with teaching parents how to provide this same type of environment. The CHIEF intervention uses the same service delivery model as HOPS. However, during each of the 16 meetings, the SMH provider implements a behavior management and points system, sets work completion goals, and has the student complete homework and study for tests. During the two parent meetings, caregivers are taught how to set clear work completion goals and to implement the behavioral point system at home to encourage focus and efficiency with work completion. To date, the CHIEF intervention has not undergone an empirical evaluation. Although having two separate brief interventions is ideal from a resource utilization perspective, it poses challenges for clinicians in determining which intervention to use. The adolescent's behavioral presentation, and in particular, their symptom severity and executive function (EF) abilities, may be useful in choosing the best approach.

Present Study

The purpose of the present study was to compare the HOPS and CHIEF interventions to each other and to a waitlist control, while seeking to address common research-to-practice barriers. Importantly, the intervention was delivered by SMH providers who had recently graduated with a masters' degree in school counseling. These SMH providers received the HOPS and CHIEF manuals and met with the lead author twice (1 hr each time) to review the manuals prior to implementing the intervention. They did not receive any ongoing consultation or supervision during the trial. Further, school counselors and psychologists directly referred students to receive the intervention and efforts were made to recruit a diverse sample.

We hypothesized that both HOPS and CHIEF would demonstrate significant improvements compared with waitlist on measures of homework problems. Intervention-specific hypotheses included that HOPS would demonstrate significantly greater improvements in comparison with CHIEF on measures of organization and planning skills. Although students were randomly assigned to condition, in practice, schools would likely choose to implement HOPS or CHIEF based upon student characteristics and school professionals' judgment of who was most likely to respond. As such, this study also included moderation analyses. We were interested in evaluating whether behavioral presentation could be used to predict response. Given that almost all adolescents with ADHD have clinically significant inattention symptoms, we evaluated hyperactive/impulsive (HI) and oppositional defiant disorder (ODD) symptoms as potential moderators. ADHD medication status was also evaluated as a moderator. We did not have hypotheses about the impact of HI, ODD, or medication use on treatment response. Finally, we were interested in whether an adolescent's EF abilities could be used to predict outcomes. The HOPS intervention targets some metacognitive aspects of EF (i.e., planning and organization), whereas CHIEF targets more of the behavioral regulation aspects of EF (i.e., task shifting and inhibition). As such, we predicted that more severe metacognitive deficits would be associated with greater improvement in HOPS and more severe behavioral regulation deficits would be associated with greater improvement in CHIEF.

Method

The present study was conducted in seven public middle schools. In a three-group design, stratified for ADHD medication status at baseline, participants were randomly assigned within middle school to either; (a) HOPS; (b) CHIEF, or (c) Waitlist using a 2:2:1 ratio. Specifically, at each of the schools there was more interest than could be accommodated. Once all interested participants at a school were assessed and eligibility determined, a random number generator was used to assign participants to group while with two students assigned to HOPS and CHIEF for every one student assigned to Waitlist. The involved schools were all within one large and diverse public school district and served 6, 7, and 8 grade students. Schools were purposefully selected to represent a range of settings and family backgrounds. For example, in one of the urban schools involved in the project, the student body was 9% White, with 67% of students eligible for free or reduced price lunch. Another school involved in the project reported a student body including 45% African American, 38% White, and 9% Hispanic/Latinx students, with 39% of students eligible for free or reduced price lunch. In contrast, one of the suburban schools in the project reported a student body of 78% White, 9% African American, and 4% Hispanic/Latinx students with only 8% of students eligible for free or reduced price lunch. The university institutional review board approved the study and all participants signed informed consent/assent.

Design

Students were recruited in six cohorts over three successive school years (i.e., one cohort recruited and enrolled each semester). Each year, two schools new schools participated in the project for the entire year (Fall and Spring semesters), with the exception of Year 3 when three schools were involved. Students were randomly assigned to condition within school. Across the 3-year study, six SMH providers who had recently graduated from a M.Ed. in counselor education program implemented the interventions. All of the counselors were Caucasian, ranged in age from 25–27, and working on the project was their first fulltime employment. Importantly, participants were randomly assigned to SMH provider and each SMH provider implemented both interventions (HOPS and CHIEF) with an equal number of students within each school. This design was chosen to reduce the potential impact of SMH provider effects. However, this design carries the risk of diffusion across conditions, so fidelity was carefully assessed and the coded checklists included multiple items asking about contamination.

During the consent process, the HOPS and CHIEF interventions were described and presented as equivalent options for addressing homework problems. Parents were shown how each intervention addresses a different aspect of the homework completion cycle. In addition, a manipulation check was completed using a parent-completed questionnaire that asked which intervention parents preferred (HOPS or CHIEF) and parents also rated satisfaction with the intervention they received (see Results section). For ethical reasons, the waitlist control group ($N = 52$) was only waitlisted for one semester and then received treatment ($23 =$ HOPS, $20 =$ CHIEF; $N = 9$ did not receive intervention because they were no longer attending the same school). The study SMH providers delivered the interventions to the waitlist participants. As

such, pre- and postintervention data are available for all three groups (HOPS, CHIEF, waitlist), but follow-up data (collected at the end of the second semester of involvement in the study) is only available for HOPS and CHIEF participants.

Recruitment

The lead author went to each school and explained that the interventions focused on homework problems for students with attention and behavior problems. School counselors and psychologists were given recruitment flyers that described the study as offering “homework interventions for students with attention and behavioral difficulties and/or with ADD/ADHD.” Recruitment flyers were not mailed to all students as doing so and waiting for parents to call research staff risks having only the most motivated families’ call and participate. Further, using broad mailings with passive recruitment, students are recruited who SMH providers would not typically have chosen to serve with intervention (i.e., likely to be less severe; Weisz et al., 2013).

Instead, school counselors and psychologists within each school identified students and called the parents directly to ask for permission to pass along their contact information to study staff so that staff could explain the interventions in detail. This allowed study staff to reach out to families, often through repeated contacts using multiple communication methods, rather than relying on motivated families to call and inquire about the study. When staff called families, the interventions were described and a phone screen was administered. In order to be scheduled for an inclusion/exclusion eligibility evaluation, parents had to endorse their child as currently exhibiting at least four of nine *DSM-IV-TR* ADHD symptoms of inattention.

Those meeting the screening criteria were scheduled for an evaluation to determine eligibility. Criteria for inclusion in the study required that children (a) attended one of the participating schools; (b) met full *DSM-IV-TR* diagnostic criteria for ADHD (i.e., at least six symptoms within a domain, evidence of symptom-related impairment in at least two settings, age of onset, persistent across time, and not better accounted for by another psychiatric condition) based on the Parent Children’s Interview for Psychiatric Syndromes (P-ChIPS; Weller, Weller, Fristad, Rooney, & Schecter, 2000) or combined with teacher ratings on the NICHQ Vanderbilt ADHD Rating Scale (Wolraich et al., 2003); (c) demonstrated an IQ of 80 or above as estimated using the Wechsler Intelligence Scale for Children—Fourth Edition (WISC-IV; Wechsler, 2003); and (d) did not meet diagnostic criteria for a pervasive developmental disorder, bipolar disorder, or psychosis. Finally, adolescents were administered four subtests (word reading, pseudoword decoding, math problem solving, and numerical operations) from the Wechsler Individual Achievement Test, Third Edition (WIAT-III; Wechsler, 2009) to assess academic achievement abilities. The inclusion evaluations were administered by clinical psychology graduate students who were observed multiple times before implementing the evaluations independently. Each participant’s assessment data were then reviewed by the graduate students and a licensed clinical psychologist to determine eligibility and diagnoses. See Consort Diagram (see Figure 2) for participant flow through the study and Table 1 for details on participant diagnoses and demographic characteristics. Prevalence rates of comorbid externalizing conditions are from the parent interview

and comorbid internalizing conditions are from the adolescent interview.

Study Interventions

HOPS. The HOPS intervention implemented in this study followed the same manual and procedures as described in development work in Langberg et al. (2011) and Langberg et al. (2012). The HOPS intervention was implemented as an individual (i.e., 1:1), 16-session intervention. The first 10 sessions occurred twice weekly and the final six sessions occurred once per week. As a result, the 16 sessions were completed over an 11-week period. Three main skills areas were covered: school materials organization and management, homework recording, and planning/time-management.

For materials organization, the SMH provider taught the student a specific system of bookbag, school binder, and locker organization. The student was also taught to implement an organization system for transferring homework materials to and from school. For homework recording, the SMH provider taught the student how to accurately and consistently record homework assignments, projects and tests in a planner. In the planning/time-management portion of the program, SMH providers taught students how to break projects and studying for tests down into small, manageable pieces, and how to plan for the timely completion of each piece. Participants were also taught how to plan out after school activities using an evening schedule to balance extracurricular activities and school responsibilities. Skills instruction was completed by Session 10, after which the SMH providers focused on problem-solving difficulties, self-monitoring, and maintaining skills (for further details see Langberg, 2011).

The HOPS intervention included a point system. SMH providers completed skills tracking checklists at every intervention session that included operationalized definitions of materials organization, homework, recording, and time-management. At each HOPS session, students’ materials (e.g., binder, bookbag, and planner) were visually inspected by the SMH provider. Students received points and rewards based upon the criteria they met on the skills tracking checklists (e.g., no loose papers in bookbag = 1 point). Students could exchange the points for gift cards with 100 points equaling a \$10 gift card. On average, students in HOPS and CHIEF earned two or three gift cards during the intervention period.

The HOPS intervention included two 1-hr parent meetings. These meetings were held at the school and included the SMH provider, the student, and parent(s). The first meeting took place early in the intervention and was designed to orient the parent to the program. The second meeting took place near the completion of the intervention. The goal of the second meeting was to teach the parent how to manage the HOPS checklist completion and reward responsibilities once the intervention period ended. Parents learned about the point system and worked with the SMH provider to establish a plan for providing home-based monitoring and rewards.

CHIEF. The CHIEF intervention service delivery model was the exact same as the HOPS model (e.g., number of sessions and session length). In terms of content, students were told to bring homework or materials to study from to each

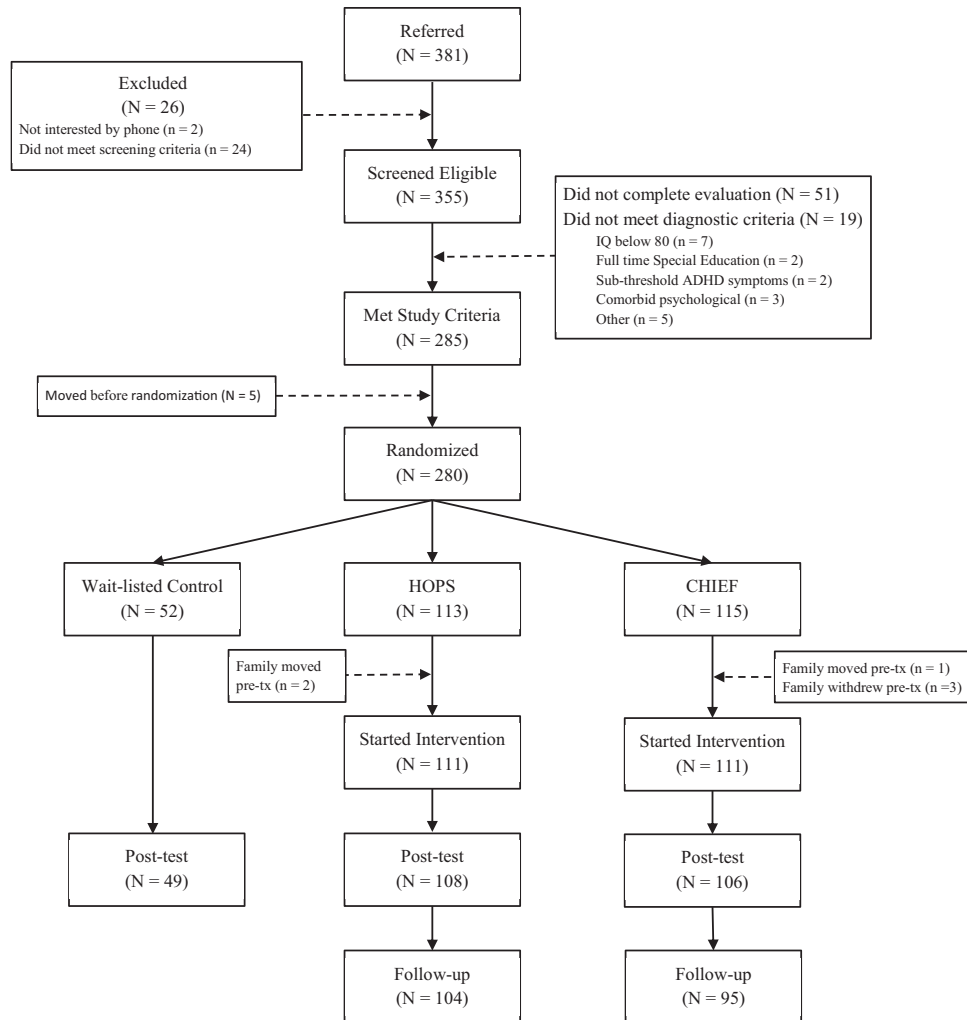


Figure 2. Study CONSORT flow diagram. Note: No participants who started the intervention dropped from the study. *N*'s reported at post- and follow-up assessments represent the collection of outcome measures; 92% of HOPS participants and 93% of CHIEF participants received all 16 sessions.

meeting. If students did not bring work, the SMH provider consulted with the students' teachers and then provided work for the student to complete at all subsequent meetings. At the beginning of each meeting, the SMH provider and student established an operationalized work completion goal (e.g., make 30 flash cards and memorize 10, or complete 25 math problems with at least 15 of them correct). The student chose what subject to focus on during the meeting but the SMH provider encouraged them to choose their "most difficult subject." Students were told that if they met their work completion goal they would receive 10 bonus points. During the meeting, SMH providers monitored on-task behavior and put a token in a jar for each minute that the student remained on-task. The manual stated that the SMH provider was also to provide 10 verbal praises during the meeting (e.g., I like how you just checked that problem for accuracy). Students earned one point for each token and points for meeting work completion goals, which resulted in the same number of available points per

session as students in the HOPS intervention. The CHIEF intervention also included two 1-hr parent meetings. The goal of the meetings was to teach the parent(s) how to monitor on-task behavior during homework completion, to set work completion goals, and to implement the point system at home.

Waitlist. Participants randomized to the waitlist condition received a list of available resources in their community at the start of the school year. Resource lists were developed in collaboration with school staff to include locally available child and family psychosocial and pharmacological intervention options. In addition, families received an evaluation report detailing the intelligence, achievement, and diagnostic findings.

Diagnostic Measures

The Children's Interview for Psychiatric Syndromes (ChIPS; Weller et al., 2000) is a diagnostic interview for administration to parents and children (children ages 6–18) and has a parent (P-ChIPS)

Table 1
Baseline Participant Characteristics by Treatment Assignment

Demographic variable	HOPS (N = 111)	CHIEF (N = 111)	Waitlist control (N = 52)
	M (SD) or % (n)	M (SD) or % (n)	M (SD) or % (n)
Child age (years)	12.00 (1.05)	12.02 (.99)	11.87 (1.12)
Gender (% boys)	66.7 (74)	77.5 (86)	80.8 (42)
Inattentive presentation	53.2 (59)	68.5 (76)	65.4 (34)
Combined presentation	46.8 (52)	31.5 (35)	34.6 (18)
On ADHD medication	56.8 (63)	52.3 (58)	51.9 (27)
WISC estimated IQ	99.48 (13.17)	99.43 (12.04)	99.98 (11.86)
WIAT reading	99.25 (12.96)	98.59 (11.80)	99.83 (10.08)
WIAT math	92.04 (13.91)	93.45 (14.29)	94.73 (14.68)
IEP	28.9 (32)	18.0 (20)	32.7 (17)
504 plan	26.1 (29)	21.6 (24)	13.5 (7)
Comorbid diagnoses	—	—	—
ODD	37.8 (42)	24.3 (27)	26.9 (14)
Anxiety disorder	30.6 (34)	26.1 (29)	19.2 (10)
Depressive disorder	5.4 (6)	7.2 (8)	5.8 (3)
Race	—	—	—
White	55.9 (62)	54.1 (60)	53.8 (28)
Black	27.9 (31)	31.5 (35)	23.1 (12)
Asian	.9 (1)	2.7 (3)	.0 (0)
American Indian	1.8 (2)	.9 (1)	.0 (0)
Multiracial	13.5 (15)	6.3 (7)	13.5 (7)
Parent education	—	—	—
At least one parent with some college	45.0 (50)	51.4 (57)	57.7 (30)
Family income	—	—	—
<\$25,000	12.6 (14)	15.3 (17)	11.5 (6)
\$25,000–\$75,000	39.6 (44)	38.7 (43)	26.9 (14)
>\$75,000	47.7 (53)	45.9 (51)	61.5 (32)

Note. Chi-Square and ANOVA testing found nonsignificant group differences for all variables. ADHD = attention-deficit/hyperactivity disorder; CD = Conduct Disorder; IEP = Individualized Education Plan; ODD = oppositional defiant disorder; WIAT = Wechsler Individual Achievement Test; Medicated = medicated for ADHD; WISC = Wechsler Intelligence Scale for Children. Comorbid diagnoses established based on parent-report on the PChIPS; anxiety counted as present if social phobia, separation anxiety, or generalized anxiety criteria were met on the PChIPS.

and child version (ChIPS). The ChIPS has shown high internal consistency and test-retest reliability (Fristad et al., 1998) and high convergent validity in relation to the *Diagnostic Interview for Children and Adolescents—Revised—Child Version (DICA-R-C)*; Fristad et al., 1998). Further, the ChIPS has good construct validity, with the percent of agreement between a consensus panel of child psychopathology experts and the results from ChIPS interviews ranging from 97.5% to 100% (Fristad et al., 1998).

Outcome Measures

Parents and teachers completed ratings pre- and post-intervention for HOPS, CHIEF, and waitlist, and at a 6-month follow-up for HOPS and CHIEF.

Homework Problems Checklist (HPC; Anesko, Schoiock, Ramirez, & Levine, 1987). Homework completion and homework materials management behaviors were assessed using the 20-item parent-completed HPC. For each item, parents rate the frequency of a specific homework problem on a 4-point Likert scale (0 = *never*, 1 = *at times*, 2 = *often*, 3 = *very often*). Higher scores on the measure indicate more severe problems. Factor analyses indicate that the HPC has two distinct factors (Langberg, Arnold, Flowers, Altaye, et al., 2010; Power et al., 2006) measuring homework completion behaviors (HPC Factor I) and home-

work materials management behaviors (HPC Factor II). Example items from Factor I include: (a) must be reminded to sit down and start homework; (b) daydreams during homework; and (c) doesn't complete work unless someone does it with him/her. Example items from Factor II include: (a) fails to bring home assignments and materials; (b) forgets to bring assignments back to class; and (c) doesn't know exactly what has been assigned. As such, we hypothesized that CHIEF would demonstrate larger improvements than HOPS on Factor I and that HOPS would demonstrate larger improvements on Factor II. Internal consistencies were high (Factor I $\alpha = .87$, Factor II $\alpha = .88$).

Homework Performance Questionnaire (HPQ). The Homework Performance Questionnaire (HPQ; Power et al., 2007, 2015) was completed by parents and teachers. The 13 HPQ items that were administered in this study use a 5-point scale, each with corresponding percentages to indicate the amount of time a given behavior occurs. Items are worded in the positive so that 90%–100% of the time indicates that the child does that behavior consistently well (e.g., student writes down homework assignments independently or manages homework time well). The HPQ has demonstrated convergent validity with other measures of homework (Power et al., 2007, 2015). Given the broad focus on homework problems, we did not hypothesize any differences between HOPS and CHIEF on this measure.

Internal consistency was high for parents $\alpha = .91$ and adequate for teachers $\alpha = .83$.

Children's Organizational Skills Scale (COSS; Abikoff & Gallagher, 2008). The COSS yields three subscale scores that have been validated through factor analysis: task planning, organized actions, and memory and materials management. Items on the task planning subscale relate to children's proficiency with planning out the steps needed to complete tasks in order to meet deadlines. Items on the organized actions subscale relate to children's use of tools (e.g., planners and calendars) and strategies (e.g., lists) to accomplish tasks. Items in the memory and materials management subscale relate to whether children lose items and how well they manage their materials (e.g., bookbags, binders, and supplies). Test-retest reliability with the three COSS subscales is high for the parent (.94–.99) and teacher (.88–.93) versions. Given the focus on organization and planning skills, we hypothesized that HOPS would outperform CHIEF on this measure. In the present study, the COSS subscales had adequate internal consistencies (parent α s = .74–.93; teacher α s = .82–.94).

Grade point average (GPA). Grades for each participant were collected from the school offices at the end of each academic year. All grades were converted into GPA for core subject areas (English/language arts, social studies, math, science) with a range from 0.0 to 4.0 (4.0 = A; 0 = F).

Parent satisfaction. A 13-item satisfaction questionnaire developed in prior work (Langberg, Vaughn, et al., 2011) was completed by parents. The majority of items assessed satisfaction related to specific components of the interventions. For example, HOPS parents were asked to rate how well the binder organization system worked for their child. In addition, parents in both groups responded to more general questions about overall satisfaction with the intervention. Parents indicated their agreement with each statement on a 5-point Likert scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *neutral*, 4 = *agree*, 5 = *strongly agree*). Statements were phrased so that higher scores represented greater satisfaction. Three additional items were added to evaluate preference for the two active treatment conditions.

Moderator Measures

Behavior Rating Inventory of Executive Function (BRIEF; Gioia et al., 2000). The BRIEF is an 86-item measure designed to assess EF abilities. Responses generate two index scores: the Behavioral Regulation Index (BRI), which evaluates an individual's ability to appropriately inhibit and control behaviors and emotions and shift between tasks, and the Metacognition Index (MI), which measures their ability to self-manage and monitor one's own progress and performance. Prior research has found good convergent validity and test-retest reliability for the BRIEF (Gioia et al., 2000; Mahone et al., 2002). Internal consistency within the current study for parent ratings was high for the index scores (α s = .92–.95).

Vanderbilt ADHD Diagnostic Parent Rating Scale (VADPRS; Wolraich et al. 2003). The VADPRS is a *DSM-IV*-based scale that includes all 18 *DSM-IV* symptoms of ADHD. Parents rate how frequently each of symptoms occur on a 4-point Likert scale (0 = *never*, 1 = *occasionally*, 2 = *often*, 3 = *very often*). The VADPRS produces an inattention score (sum of the nine inattention items), a hyperactivity/impulsivity score (sum of the nine hyperactive/impul-

sive items), and an ODD score (sum of the eight ODD items). Internal consistencies were high in the present study (inattention $\alpha = .92$, hyperactivity/impulsivity $\alpha = .96$, ODD $\alpha = .94$).

Service Use

Participants' use of medication and other treatments for ADHD was documented at baseline and tracked across time by interviewing parents. Similar to the methodology used in the Multimodal Treatment Study of ADHD (MTA Cooperative Group, 1999), these data were used to create a variable indicating the percent of days the child was taking medication during the study to include a covariate in the analyses.

Treatment Fidelity

SMH providers were given digital audio recorders and taped HOPS and CHIEF student and parent meetings. Research staff (coders) initially listened to meetings together to calibrate scoring. Next, staff coded HOPS and CHIEF meetings individually and scoring was reviewed weekly to ensure reliability was above 90%. All criteria were written in objective terms and as such, agreement was consistently above 95%. After reliability was obtained, 30% of all HOPS and CHIEF meetings were identified for further coding. Audio-recordings were grouped by intervention session and SMH provider. Next, recordings were randomly selected within the SMH provider and session order to ensure that all SMH providers' data and meetings from the beginning, middle, and end of the interventions were equally represented. These same procedures were used for coding the HOPS and CHIEF parent meetings. Staff double-coded all of the selected sessions and at no point did interrater reliability drop below 95%.

HOPS. Ninety-two percent of participants received all 16 HOPS sessions and the remaining 8% received 50%–70% of sessions. On average, HOPS meetings lasted 17.42 min ($SD = 3.50$). Fidelity coders listened to the tapes and coded whether the required intervention components (e.g., SMH provider completed the organizational skills checklist, or SMH provider introduced the evening schedule) were present or absent (1 = *implemented* or 0 = *not implemented*) for each session. Overall, adherence to HOPS intervention across sessions and providers was 85.44%. When averaged separately for each SMH provider, the lowest SMH provider was 78.81% and the highest was 89.56%. The fidelity ratings completed by the coders also asked about contamination (e.g., did the SMH provider have the student complete homework and monitor on-task behavior and focus). This item was only endorsed twice across all of the audio-recorded intervention sessions.

For HOPS parent sessions, the average session lasted 42.15 min ($SD = 14.26$) and 87% of parents attended both sessions. A separate 11-item rating form was used by the coders to assess adherence (e.g., Did the SMH provider graph and review the student's progress? Did the SMH provider introduce a reward system?). Adherence was high, with an average of 92.50% of criteria being met, ranging from 87.41% to 96.59% by SMH provider. There was also one item regarding contamination on the checklists used by the coders (i.e., Did the SMH provider discuss any strategies for improving focus or efficiency during homework completion?), and this item was not endorsed for any of the HOPS parent sessions.

CHIEF. Ninety-three percent of CHIEF participants received all 16 sessions, 6% received between 50% and 70% of sessions, and one student received only three sessions. The average CHIEF meeting length was 19.42 min ($SD = 1.88$). The items on the CHIEF fidelity checklist were also marked as either yes (1 = *implemented*) or no (0 = *not implemented*). Criteria on the checklist include, but are not limited to “SMH provider set a work completion goal at the beginning of session” and “SMH provider used the token system to reward the student for staying on-task.” Overall, adherence to the CHIEF intervention was high with, an average of 89.23% of criteria met across sessions. Individual SMH provider adherence ranged from 84.92% to 95.92% of criteria met. The contamination item (i.e., Did the SMH providers discuss any strategies for homework management, organization, or planning?) was not endorsed.

Similar to HOPS, an 11-item rating form was used to code the parent sessions and included criteria specific to the CHIEF intervention manual. On average, CHIEF parent meetings lasted 40.65 min ($SD = 13.94$) and 83% of parents attended both sessions. Overall, SMH provider fidelity in the CHIEF parent session was 77.89%. The contamination item was endorsed two times (less than 1% of all parent meetings reviewed).

Analytic Plan

All statistical analyses were performed in SAS version 9.4. Preliminary analyses involved investigation of missing data and assessment of baseline characteristics by treatment group (see Table 1) to examine whether randomization was effective. To facilitate comparison across recent studies targeting homework and organization problems in students with ADHD with similar three group designs, we followed the analytic plans used in Abikoff et al. (2013) and Pfiffner et al. (2014). Primary analyses involved comparisons between the three conditions (analyses of covariance [ANCOVAs]) on the post-treatment outcomes, controlling for pretreatment scores (see Table 2). The main effect of condition was interpreted as reflecting an effect of group, which was followed-up with a set of three planned post hoc

contrasts comparing the least-squared mean estimates at post. The p values from these post hoc analyses were corrected for multiple comparisons across all comparisons using false discovery rate procedures (FDR; Benjamini & Hochberg, 1995). The p values reported are corrected values. In order to assess maintenance of treatment effects, these models were repeated using follow-up outcomes, and within-group posttreatment and follow-up scores were compared. Cohen’s d effect sizes were calculated using standardized mean difference scores to examine the magnitude of between group differences (Kline, 2004).

As described above, by design, school and counselor were not related to randomization. Nevertheless, the potential impacts of school and counselor effects were explored with random effects models to examine/account for the nested nature of these variables (i.e., students nested within school and students nested within counselor). Intraclass correlations (ICCs) and design effects were examined for each outcome to determine whether variance at the school and counselor level should be accounted for. For each outcome, the ICCs (.02 to .04) and design effects (1.47 to 1.92) were well within recommended limits (e.g., Cameron & Miller, 2015; Lee, 2000). HOPS versus CHIEF group differences were tested for each of the outcomes using two-level models in order to account for the school and counselor-level variance and the results followed the same pattern (i.e., not significant). As such, the findings reported in the results and Table 2 do not include school and counselor effects in the model.

Five baseline moderator variables were examined: ADHD symptom severity, ODD symptom severity, BRIEF BRI, BRIEF MI, and ADHD medication status. The effect of a moderator variable on treatment outcomes was explored by fitting models similar to those described above that included an interaction between a moderator variable and condition. In all moderation analyses, baseline indicators were entered as covariates. In the presence of interaction effects, we used the “plot” subcommand for Model 1 implemented in the PROCESS macro for SAS (Hayes, 2013). This generates a table of predicted values for the dependent variable at specified values of the moderator variable

Table 2
Functioning at Posttreatment, Controlling for Pretreatment, by Treatment Assignment

Dependent variable	HOPS		CHIEF		WLC		$F(2, 270)$	p	η_p^2	ES and pairwise comparisons ^a		
	Est. M	SE	Est. M	SE	Est. M	SE				HOPS-CHIEF	HOPS-WLC	CHIEF-WLC
PR HPC Factor I	12.70	.35	13.40	.36	17.39	.52	29.19	<.001	.18	-.19	-1.27***	-1.06***
PR HPC Factor II	28.28	.68	27.79	.68	34.46	.98	17.21	<.001	.11	.07	-.87***	-.94***
PR HPQ total	34.45	.95	32.40	.95	21.66	1.39	30.30	<.001	.18	.21	1.29***	1.08***
TR HPQ total	27.58	1.04	28.67	1.04	29.19	1.52	.47	.629	.00	-.10	-.15	-.05
PR task planning	12.17	.29	12.32	.30	14.59	.44	11.70	<.001	.08	-.05	-.79***	-.72***
PR organized actions	28.90	.37	31.54	.37	33.31	.54	25.84	<.001	.16	-.68***	-1.14***	-.46**
PR materials management	18.94	.39	19.92	.39	22.23	.57	11.31	<.001	.08	-.24	-.81***	.57**
TR task planning	12.39	.30	12.48	.30	12.19	.43	.15	.857	.00	-.02	.06	.09
TR organized actions	33.17	.40	35.19	.49	35.66	.72	3.57	.030	.03	-.43*	-.55**	-.09
TR materials management	20.49	.51	22.10	.51	23.07	.74	4.08	.018	.03	-.30	-.53**	-.18

Note. Est. M = estimated means, adjusted for pretreatment score; PR = primary caregiver; TR = teacher; η_p^2 = partial eta-squared. For partial eta-squared, .01 is considered small, .06 is considered medium and .14 is considered large effect (Cohen, 1988). For Cohen’s d effect sizes, .20 considered small but likely meaningful, .50 considered a medium effect and .80 is considered large (Cohen, 1988).

^a Standardized mean differences (Cohen’s d) in pairwise comparisons of treatment groups reported effect size.

* Significant after within-domain Benjamini-Hochberg false discovery rate correction.

* $p < .05$. ** $p < .01$. *** $p < .001$.

(set here as five values: the 10th, 25th, 50th, 75th, and 90th percentiles). The covariates in the model were set to their sample means when deriving the predicted values. Categorical variables used their inherent categories. We then examined the pairwise comparisons of treatment group and examined the effect of condition at each level of the moderator. We report the betas and p values associated with the test of moderation at each point for the outcomes in Table 3.

Results

Of the 280 randomized participants, six participants moved schools before starting treatment (see Figure 2; Consort Diagram). The analyses include all participants who at least started the intervention regardless of number of sessions completed ($N = 111$ HOPS; $N = 111$ CHIEF; $N = 52$ Waitlist). To manage missing values, we employed multiple imputation (Little & Rubin, 2002; Rubin, 1996), using a sequential regression multivariate imputation algorithm as implemented in the IVEware (Raghunathan,

Solenberger, & Van Hoewyk, 2002) package for SAS. The imputation model included participants' age, sex, treatment condition, and parent and teacher report measures. Specifically, all missing outcomes assessing a similar construct were imputed together. For example, all three COSS factors (task planning, organized actions, materials management) for both parent- and teacher-report were imputed together to increase efficiency and reduce bias compared with analysis of the observed cases only (Spratt et al., 2010; Sterne et al., 2009). Two-hundred imputed data sets were generated, and the results of identical analyses on each imputed data set were combined using conventional guidelines (Little & Rubin, 2002). Of note, results were the same with and without missing data imputed.

Baseline Equivalence

The HOPS, CHIEF, and waitlist groups did not differ on baseline demographic and clinical characteristics (see Table 1). We also examined interactions between baseline scores and condition

Table 3
Conditional Effects of Intervention on Outcomes at Values of the Moderators

DV	Moderators	Values	Effect of HOPS vs. CHIEF	p	Bootstrapped	
					SE	95% CI
PR HPC Factor I	HI	10	.84	.311	.828	[-.789, 2.470]
		25	.28	.667	.659	[1.014, 1.581]
		75	-1.57	.011	.613	[-2.780, -.366]
		90	-2.32	.006	.829	[-3.948, -.684]
PR HPC Factor II	HI	10	-3.91	.013	1.573	[.816, 7.013]
		25	-2.69	.032	1.251	[.230, 5.158]
		75	1.37	.235	1.154	[-.899, 3.645]
		90	2.99	.056	1.563	[-.079, 6.077]
PR HPQ total	HI	10	-3.63	.100	2.200	[-7.963, .700]
		25	-1.67	.339	1.754	[-5.119, 1.770]
		75	4.85	.003	1.616	[1.666, 8.030]
		90	7.46	.001	2.189	[3.146, 11.767]
	MI	10	.71	.656	1.601	[2.431, 3.857]
		25	2.26	.097	1.354	[-.409, 4.932]
		75	-4.64	.005	1.651	[-1.389, -7.892]
		90	-6.42	.002	2.059	[-2.370, -10.479]
PR materials management	HI	10	1.2	.176	.903	[-.553, 3.005]
		25	.44	.538	.719	[-.972, 1.860]
		75	-2.16	.001	.661	[-3.465, -.863]
		90	-3.21	<.001	.893	[-1.448, -4.967]
TR materials management	ODD	10	1.38	.217	1.118	[-.817, 3.586]
		25	.67	.472	.930	[-1.162, 2.501]
		75	-2.19	.011	.865	[-3.892, -.486]
		90	-3.62	.004	1.243	[-6.064, -1.174]
	BRI	10	.37	.756	1.202	[-1.994, 2.741]
		25	-.04	.969	.925	[-1.857, 1.786]
		75	-2.74	.034	1.256	[-5.219, -.261]
		90	-3.03	.031	1.399	[-5.787, -.277]
TR organized actions	ODD	10	.71	.508	1.063	[-1.389, 2.800]
		25	.01	.991	.886	[-1.753, 1.734]
		75	-2.87	.001	.826	[-1.242, -4.495]
		90	-4.30	<.001	1.185	[-1.965, -6.632]
	BRI	10	-.26	.819	1.151	[-2.531, 2.003]
		25	-.80	.376	.905	[-2.582, .980]
		75	-2.50	.004	.855	[-4.187, -.820]
		90	-3.04	.006	1.087	[-5.183, -.899]

Note. All models controlled for baseline measures of the outcome. PR = parent-report; TR = teacher-report; HI = parent-rated ADHD hyperactive/impulsive symptoms; ODD = parent-rated oppositional defiant disorder symptoms; HPC = Homework Problems Checklist; HPQ = Homework Performance Questionnaire; MI = BRIEF Metacognitive Index; BRI = BRIEF Behavioral Regulation Index.

to assess whether the assumption of homogeneity of regression lines was met. Pretreatment equivalence between the groups on all ratings and GPA was demonstrated.

Posttreatment Effects

Results, including *p* values for tests and effect sizes, are provided in Table 2. Significant effects at posttreatment, controlling for pretreatment score, were found for both organization and homework outcomes including: for parent HPC homework completion factor, $F = 29.19, p < .001$ and homework materials management factor, $F = 17.21, p < .001$; parent HPQ total score, $F = 30.30, p < .001$; parent task planning, $F = 11.70, p < .001$; parent organized actions, $F = 25.84, p < .001$; parent materials management, $F = 11.31, p < .001$; teacher organized actions, $F = 3.57, p = .030$; and teacher materials management, $F = 4.08, p = .018$. The same significant effects were also obtained when, in addition to pretreatment score, we covaried for cohort, sex, IQ, ADHD medication, and education level of primary parent. Between group analyses of GPA were not significant, $F = 1.354, p = .236$ and the effect size was in the small range (partial eta-squared = .012). For participants in HOPS, GPA increased slightly from ($M = 2.15; SD = .85$) at baseline to ($M = 2.33; SD = .78$) the quarter following completion of the intervention. For participants in CHIEF, GPA decreased slightly from ($M = 2.20; SD = .92$) to ($M = 2.04; SD = 1.1$) during the same period as did the GPA for control participants ($M = 2.42; SD = .85$ to $M = 2.39; SD = 1.1$).

Two of the 10 post hoc comparisons between HOPS and CHIEF were significant after the Benjamini-Hochberg FDR correction. HOPS participants showed significantly fewer parent and teacher-rated problems with organized actions relative to CHIEF participants at posttreatment. The effect sizes were moderate ($d_s = .68, .43$). All post hoc comparisons between HOPS and WLC were significant with the exception of teacher-rated homework performance and COSS task planning. In five of eight instances, effect sizes for these comparisons were large ($d_s = 0.79$ to 1.29); for two (teacher COSS) the effect sizes were moderate ($d_s = .53-.55$). Regarding the CHIEF versus WLC comparisons, six comparisons were significant. At posttreatment parents of CHIEF students reported significantly fewer homework problems ($d_s = .94-1.08$) and organization, planning and materials management problems ($d_s = .46-.72$) in comparison with waitlist but no significant effects were found for teacher ratings.

Moderation

Exploring interactions between treatment condition and moderator variables indicated differential treatment effects. We ran the analyses described above with the addition of continuous moderator variables, and examined their effects at their 10th, 25th, 50th, 75th, and 90th percentiles (see Hayes, 2013). Significant effects are presented in Table 3.

There was a significant Group \times HI interaction predicted parent-rated HPC Factor I, Factor II, parent-rated HPQ total score (see Figure 3), and parent-rated COSS materials management. For those with elevated HI, HOPS participants had significantly fewer homework and organization problems in comparison with CHIEF ($p < .011$), whereas at low levels of HI, the HOPS and CHIEF

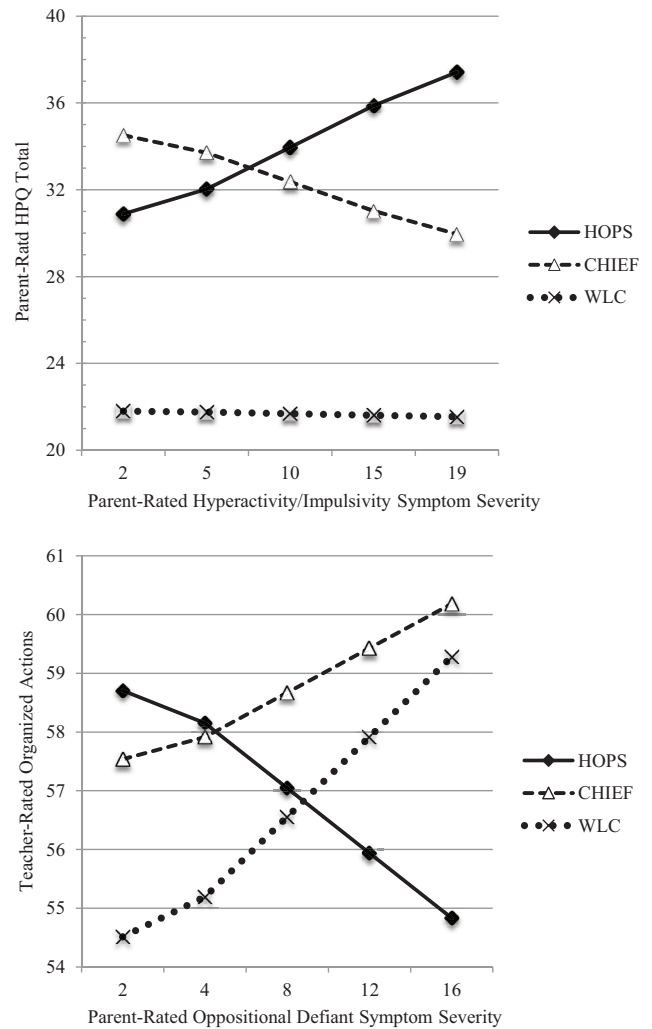


Figure 3. Patterns of moderated treatment response: Sample outcomes. Note: Higher scores on the Homework Performance Questionnaire (HPQ) represent more positive homework behavior. Higher scores on the organized actions subscale represent greater problems with organization behavior.

groups did not differ, with the exception of on the HPC factor II in which those with low hyperactivity/impulsivity in the CHIEF group had fewer homework problems relative to those in HOPS (p_s from .013-.032). There was also a significant Group \times MI interaction on the parent-rated HPQ total score, a Group \times BRI interaction as well as a Group \times ODD interaction on teacher-rated materials management and organized actions (see Figure 3). All interaction effects demonstrated indicated that for those with higher severity (more problems at baseline), HOPS participants had significantly fewer homework and organization problems than those in CHIEF. At the 75th and 90th percentiles, effect size differences between HOPS and CHIEF for all moderation analyses were small to moderate ($d_s = .30-.51$).

Maintenance Effects

We conducted within-group analyses between posttreatment and follow-up as a means of uncovering which group(s) changed in

functioning. Tests were not significant for any contrast with two exceptions: parents in the HOPS group reported improved organized actions from posttreatment to follow-up, $t = -2.71$, $p = .008$ and CHIEF parents reported worse materials management problems from posttreatment to follow-up, $t = 2.30$, $p = .02$.

Satisfaction

Parent satisfaction with both HOPS and CHIEF was very high (HOPS $M = 4.50$ [.81]; CHIEF $M = 4.50$ [.45]) and did not significantly differ between treatment groups. The vast majority of parents (90.7%) rated that they were receptive to their child receiving either of the two interventions (i.e., "I was OK with my child receiving either of the two interventions"). When specifically asked to choose, 55% percent of parents reported that they thought HOPS would be better for their child, while 37% reported that they thought CHIEF would be better, and 8% of parents responded neutrally.

Discussion

This study evaluated the impact of two relatively brief interventions, HOPS and CHIEF, implemented during the school day by SMH providers on the homework problems and organizational skills of young adolescents with ADHD. The HOPS intervention targets organization and planning aspects of homework, whereas the CHIEF intervention targets focus and efficiency during homework completion. Participants in both HOPS and CHIEF made large, significant, pre- to post-improvements on parent ratings of homework problems and organization and planning skills as compared with a waitlist control (HOPS d s range from .79–1.27; CHIEF d s range from .57–1.08; see Table 2), and these gains were maintained at a 6-month follow-up. Only HOPS participants made significant improvements in comparison with waitlist according to teacher ratings, with moderate effect size differences for teacher-rated COSS Organized Actions and Materials Management.

Contrary to hypotheses, CHIEF did not outperform HOPS on a measure of focus and efficiency during work completion (HPC Factor I) and HOPS only significantly outperformed CHIEF on one aspect of organization and planning skills (organized actions as rated by parents and teachers on the COSS; e.g., use of planners, calendars, and lists). However, additional clinically meaningful differences were found between HOPS and CHIEF when student characteristics were taken into consideration through moderation analyses. Specifically, the HOPS intervention was associated with significantly greater improvements in comparison with CHIEF on ratings of homework problems and organizational skills for students who had more severe psychopathology and EF impairment. Of equal importance, the HOPS and CHIEF interventions were implemented with fidelity, during the school day, by SMH providers, and with a diverse group of students. Further, because of the school-based nature of the interventions, attendance was very high, with over 90% of participants receiving all 16 sessions.

The data from this study contribute to a fairly extensive body of literature documenting that interventions targeting the homework and organization problems of students with ADHD are effective (Bikic et al., 2016; Evans, Owens, & Bunford, 2014). Effect sizes found in the current study for parent ratings are comparable with other recent studies focused specifically on adolescents with

ADHD (e.g., Evans et al., 2016; Sibley et al., 2016), and somewhat below what has been reported with elementary age samples (e.g., Abikoff et al., 2013; Merrill et al., 2017). These differences highlight the challenges associated with working with adolescents with ADHD, who typically have experienced repeated failures and often approach intervention efforts with apathy and low motivation (Eddy et al., 2015; Sibley et al., 2016). There are also significant contextual differences between elementary and secondary school settings. For example, managing materials and planning ahead for multiple classes in middle school is a complex process and adolescents are expected to assume more independence for these behaviors (Evans et al., 2014). Regardless, the magnitudes of the gains associated with both HOPS and CHIEF in comparison with waitlist are clinically meaningful, especially considering that the interventions are brief and implemented by typically trained SMH providers.

Consistent with most other studies focused on adolescents with ADHD, group differences on teacher ratings were not as large as differences according to parent ratings (e.g., Evans et al., 2016; Sibley et al., 2016). In addition, the three groups did not differ significantly on GPA and the between group effect size was in the small range. In general, HOPS Participants GPA increased slightly during the intervention period (+.18), while CHIEF (−.16) and waitlist (−.03) Participants GPA declined slightly. Parents were not blind to group assignment, and the potential for an expectancy bias in parent ratings has been raised as a criticism of the ADHD psychosocial literature as a whole (Sonuga-Barke et al., 2013). However, in the present study, parents were minimally involved with the intervention. Further, there were two active intervention conditions and parents expressed equivalent satisfaction with HOPS and CHIEF postintervention. As such, differences between HOPS and CHIEF on parent ratings cannot be attributed to bias.

Hyperactive/impulsive (HI) symptoms were the most common moderator for parent-rated outcomes and ODD and BRI moderated teacher rated outcomes on the COSS. In all cases, improvements associated with HOPS and CHIEF were equivalent for students with the least severe behavioral presentations (e.g., few HI and ODD symptoms), but students with more severe behavioral presentations did significantly better with the HOPS intervention. For example, HOPS participants at the 75th and 90th percentiles for HI had significantly fewer homework problems in comparison with CHIEF and waitlist according to parent ratings on the HPC and HPQ (see Table 3). For teacher ratings, HOPS participants with higher levels of ODD and BRI deficits significantly outperformed CHIEF and waitlist participants on the COSS materials management and organized actions subscales. Importantly, the magnitude of these moderation effects was clinically meaningful (e.g., see Figure 3). The fact that the CHIEF intervention did not demonstrate significant effects on teacher ratings even in the moderation analyses is not surprising because the intervention targeted focus and efficiency with work completion in the home setting. The reason students with more severe behavioral presentations did better with HOPS is not clear. One possible explanation is that students with more severe presentations are more likely to struggle with multiple aspects of the homework completion cycle, and HOPS targets more behaviors than CHIEF (see Figure 1).

Perhaps the most important contribution this study makes to the ADHD intervention literature is the focus on using stakeholder input to develop and evaluate interventions that have the potential

for widespread implementation. Overcoming the research-to-practice gap is arguably the most important clinical/research issue of our time (Weisz et al., 2013; Woolf, 2008). The acknowledgment that most evidence-based interventions never make it into real world settings has led mental health researchers to move toward the evaluation of brief interventions, in their intended settings, under more typical conditions. These relatively brief interventions are demonstrating promise for a variety of conditions, including but not limited to, alcohol use (Hennessy & Tanner-Smith, 2015), autism (Wood, McLeod, Klebanoff, & Brookman-Frazee, 2015), risky behaviors (Dishion et al., 2015), and general problem behavior (Sanders, Kirby, Tellegen, & Day, 2014). There are also some examples in the ADHD literature of brief and feasible interventions targeting classroom behavior (e.g., Fabiano et al., 2017; Holdaway & Owens, 2015). However, to date, brief school-based interventions that target the homework and organization problems common in adolescents with ADHD have not been evaluated.

In the current study, the average session time was less than 20 min and a common SMH provider service delivery model (i.e., pulling from elective classes) was utilized. For feasibility reasons, parents were only asked to attend two sessions and were not paid for attending these sessions as is sometimes done in research studies; yet they were still well attended (87% HOPS; 83% CHIEF families attended both sessions). This may be because the interventions focused explicitly on improving academic outcomes, which can help engage parents and increase the likelihood that schools will adopt and sustain interventions (Bruns et al., 2016; Lyon, Ludwig, et al., 2014). Further, the intervention sample was directly referred by SMH providers and was diverse in terms of race and socioeconomic status. Overall, these factors make it likely that both the HOPS and CHIEF interventions could be implemented in school settings under typical conditions, and increase confidence that the results will generalize to the types of students SMH providers most commonly treat.

Limitations

There are a few important limitations to consider when evaluating the study findings. First, it is important to acknowledge that although the SMH providers received minimal training and supervision, they were hired and paid through the research grant. Further, they knew that sessions were being audio-taped and would be reviewed by research staff. This likely had an impact on how the interventions were implemented, and without these mechanisms in place, fidelity to the intervention procedures may have been lower which could impact outcomes. Second, the trial involved a relatively small number of schools and SMH providers in a single geographic location. As such, it is unclear whether the findings will generalize broadly to all school and SMH providers. Third, we tested an individual (1:1) service delivery model which is more resource intensive than small group or classroom based models. It could be easier to widely disseminate and implement these types of interventions if teachers were the service providers, or if the school taught and reinforced these skills with all students (i.e., a universal intervention) using a tiered approach (Bruns et al., 2016). Third, for ethical reasons, the waitlist control group received the intervention after the first semester and there are no control group data for the 6-month follow-up. As such, it is not possible to determine

if the magnitude of the difference between the intervention and control groups increased or decreased over time or whether trends in the GPA data continued. Finally, although the study recruitment procedures were designed to mirror traditional school identification and intervention practices, concerns about generalization remain as these are still families who agreed to engage in research and completed a time intensive inclusion/exclusion evaluation. Further, although the sample was diverse from a racial and socioeconomic perspective, it is important to acknowledge that approximately half of the sample made more than \$75,000 per year; above the median household income as reported by the U.S. Census Bureau in 2015 (\$56,516).

Clinical Implications

The data from this study suggest that both HOPS and CHIEF can be used to improve the homework problems of middle school students with ADHD. It is important to be clear that the CHIEF intervention was not simply a study-hall or free-period that schools often implement to encourage students to complete homework. Students in CHIEF worked one-on-one with a clinician and intensive evidence-based behavior management strategies were used to keep students on-task and working toward goals. These behavioral techniques were also taught to parents. Further, students in both HOPS and CHIEF had a structured contingency management system put in place and were working toward tangible rewards. These rewards were intended to motivate students and may be important for the success of these types of training programs. Overall, given that CHIEF was as effective as HOPS for some students, the main clinical implication is that clinicians should use assessment to drive intervention choice. If assessment reveals that a student has a more severe behavioral presentation (e.g., ODD behaviors or EF deficits), HOPS should be implemented. In addition, the homework completion cycle may be useful for clinicians when interviewing parents to facilitate a discussion about which aspects of homework are most problematic. If the parents' major concern is the length of time it takes to complete work or a lack of focus and careless mistakes during work, an intervention like CHIEF would be most appropriate. For families who report difficulties with materials organization and procrastination, HOPS would be the logical choice.

Future Directions

Mediation analyses can help uncover the key mechanisms of change associated with multicomponent interventions. In a prior study of the HOPS intervention, the binder organization system and the working alliance as rated by the student were the two strongest predictors of outcomes (Langberg et al., 2013). However, the sample size in previous work was very small ($N = 23$). It will be important for future work with HOPS and CHIEF to identify the core components not only that lead to pre- to post- gains, but also that facilitate sustained improvements across time. Parents in both of the interventions were asked to report which skills they were monitoring at the 6-month follow-up, how frequently they were monitoring, and whether they were using rewards. It will be important to evaluate whether parents' continued use of these strategies mediates sustained or increasing improvements across time. Another potentially important mediator of sustained improvements is student

motivation to complete homework. The overarching goal of most behavioral interventions is to increase internal motivation to implement skills so that external rewards can be removed (Fabiano et al., 2009). Students' self-reported homework motivation is significantly associated with their homework performance and completion as reported by teachers (Langberg et al., 2017). As such, it may be that improvements in homework motivation serve to facilitate sustained improvements across time, irrespective of continued parental monitoring and rewarding. Finally, it will be important to more closely evaluate which intervention factors (e.g., organization v. homework recording) and at what magnitude of improvement, leads to gains in GPA. It is likely that some students make significant improvements in GPA while others do not and clinically, it will be important to determine the mechanisms of action most associated with change in GPA.

Conclusions

In conclusion, both the HOPS and CHIEF interventions appear to be effective at improving homework-related problems in young adolescents with ADHD. Importantly, the use of a stakeholder focused intervention development and evaluation process increases the likelihood that these interventions can be applied in school settings with similar results. The HOPS intervention appears to be significantly more effective at improving some aspects of organizational skills in comparison with CHIEF (i.e., use of planners, calendars, and lists) for all students, and more effective at improving homework problems and organization and planning skills according to both parent and teacher ratings for adolescents with more severe behavioral presentations. Regardless, assessment using the homework completion cycle should determine which intervention to use and what skills to prioritize.

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