

ABSTRACT

Title of Dissertation: TRAJECTORIES OF CLINICIAN
COMPETENCE AND STUDENT
ENGAGEMENT DURING AN
ADOLESCENT ADHD INTERVENTION

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School-based organization, time management, and planning skills-related (OTMP) interventions have been developed to address academic and organizational difficulties students with Attention-Deficit/Hyperactivity Disorder face (ADHD), especially when entering secondary school (DuPaul et al., 2012; Evans et al., 2018; Villodas et al., 2014). For OTMP interventions to be reliably administered, interventionists must be appropriately trained to not only implement session procedures that adhere to intervention protocol, but to also adjust their responses to individual students to maintain quality interactions, which is referred to as competence (Goense et al., 2016; Perepletchikova et al., 2007). This study tested the hypothesis that the constructs, interventionist competence and student engagement, would significantly change over the course of a 16-session school-based intervention for adolescents with ADHD and academic challenges. Specific student characteristics were also expected to interact with initial levels or changes in competence and engagement over time. Using an archival dataset (N= 111) and latent growth modeling, findings revealed that neither

competence nor engagement changed significantly over time. However, initial levels of both constructs significantly varied. Further conditional growth modeling found that greater ADHD symptom severity negatively contributed to competence and that internalizing symptoms contributed uniquely and positively to competence. Although interventionist competence and student engagement did not exhibit significant change over time, certain student factors were associated with the quality of interventionists responses to students and with the degree to which students remain engaged with intervention materials.

TRAJECTORIES OF CLINICIAN COMPETENCE AND STUDENT
ENGAGEMENT DURING AN ADOLESCENT ADHD INTERVENTION

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Chapter 1: Introduction

Attention-deficit/hyperactivity disorder (ADHD) is often described as a pervasive and heterogenous neurodevelopmental disorder that is characterized by difficulties with inattention and/or hyperactivity and impulsivity. Students with ADHD exhibit significant variation in the presentation of their symptoms across age of symptom onset and across multiple contexts (Barkley, 2014). Previous researchers have considered ADHD to be a “high-incidence” disorder (DuPaul & Stoner, 2014) with upwards of 9% of students receiving a diagnosis based on a 2016 national parent-reported survey (Danielson et al., 2016). While core characteristics including the inability to maintain attention or focus and higher physical activity levels may change phenotypically over time, symptoms are often chronic and continue to affect students from childhood, adolescence, and adulthood (Barkley & Fischer, 2011; Kent et al., 2011).

Adolescents with ADHD specifically face a myriad of academic and behavioral challenges within the school setting, which are often exacerbated by additional responsibilities and expectations that students face when entering secondary school. Core symptoms may present in ways including but not limited to inconsistent task initiation and persistence (e.g., seeing tasks through to completion), inattention to instructions and assignment details, poor time management and planning for due dates, and lack of organization of materials including notebooks, desks, and written assignments (DuPaul & Stoner, 2014). In addition, within the secondary school setting, students are expected to exhibit greater independence in planning study time, completing tasks, using organizational skills (e.g., neat notebook

and desk space), and preparing for future high school experiences (Evans et al., 2014). These responsibilities can be daunting for adolescents with ADHD who face greater academic challenges than their typically developing (TD) peers. As stated in DuPaul and Stoner (2014, p. 188), “the interaction between typical impairments associated with ADHD and increasing demands for independence, self- control, organization, and time management in secondary schools significantly limits the chances for successful educational outcomes in this population.” Hence, academic impairment is one of the most common difficulties for adolescents with ADHD (Barkley, 2014; DuPaul & Langberg, 2014; Kofler et al., 2017; Molitor, 2019a).

Given these academic challenges adolescents with ADHD face, establishing and implementing evidence-based treatment approaches is imperative for student success. Specifically, interventions focusing on organizational behaviors (e.g., recording homework, planning out assignments, arranging school supplies) during school hours, may be particularly beneficial for adolescents with ADHD. Fortunately, many evidence-based treatment options are available in clinic-based, standardized research settings (Abikoff et al., 2013; Sibley et al., 2014), and have continued to be developed and researched to address ADHD concerns within the school setting (Langberg et al., 2017; Pfiffner et al., 2013). One such type of program includes organization time management and planning (OTMP), a manualized, skills-based intervention. Strong empirical evidence has demonstrated that OTMP interventions, both individualized and group treatment options, improve one of the most frequent domains of impairment for adolescents with ADHD: academic functioning within school settings (Evans et al., 2018; Kent et al., 2011).

OTMP interventions address issues regarding inattention, poor planning, procrastination, disorganization, and homework problems among students with ADHD through brief sessions (approximately 20 minutes) incorporated into the school day. Session content often consists of practicing specific skills to address the issues previously described. Skills are introduced to students by an interventionist, or a school-based mental health provider (e.g., school psychologist, school counselor, special educator) who has been selected to be trained to implement the curriculum to individual students during the school day (Breux et al., 2019; DuPaul & Stoner, 2014; Evans et al., 2018). Interventionists play a crucial role in OTMP programs by highlighting the academic benefits of using specific skills and motivating students' participation in the skills using positive reinforcement and contingency management systems (e.g., token economies) to encourage target behaviors (Barkley, 2014; Langberg, Dvorsky, et al., 2018).

Interventionists, or school-based mental health providers, typically receive an initial training (e.g., 2–3-hour workshop) followed by brief consultation throughout the duration of the OTMP intervention and are often evaluated based on their treatment integrity, or the ways in which the intervention is provided as directed. Treatment integrity is comprised of two domains: *adherence* (i.e., following manual procedures) and *competence* (i.e., quality of implementation and adjusting one's delivery of manual procedures based on individual participant needs; Goense et al., 2016; Perepletchikova et al., 2007). Additionally, competence can be broken into two separate aspects including *program-specific competence* (i.e., interventionists adjusting to session materials specific to the intervention only) or *non-specific*

competence (the interventionist's relational or therapeutic exchanges regardless of the intervention; Goense et al., 2014).

Interventionist adherence has been established as a positive predictor of treatment outcomes (Hogue et al., 2008; Webb et al., 2010) but research predicting the effects of interventionist competence (both program-specific and non-specific) on treatment outcomes has reported mixed findings. For example, in a recent school-based intervention study, interventionists with higher ratings of overall competence predicted greater percentage of student work completion and fewer organizational problems by the end of an OTMP intervention (Breux et al., 2021). However, in a review conducted by Perepletchikova and colleagues (2007), researchers used the measure, "Implementation of Treatment Integrity Procedures Scale (ITIPS)," to evaluate the extent to which randomized control trials (RCTs) of psychosocial interventions addressed treatment integrity. Findings revealed that competence was not a significant predictor and, as an explanation, authors highlighted the limitation that aspects of treatment integrity (including adherence and competence) were not adequately addressed in the literature reviewed. It is also important to note that the review included 147 studies (202 treatments) which were all conducted in clinical settings (no RCT studies were conducted in school settings).

While many studies have examined interventionist competence within clinical settings (Chu & Kendall, 2009; Goense et al., 2016; Hogue et al., 2008; Hudson et al., 2014), few studies have explored the construct within school-based delivery settings (i.e., see Beidas et al., 2012; Noell & Witt, 1999 for exceptions). To date, scant research exists that measures interventionist competence in school based OTMP

interventions (Breaux et al., 2021). Prior work has also been limited to examining competence at a single timepoint or collapsing across time. Specifically, previous research often captures interventionist competence through calculating mean scores before and after interventions or from repeated measures collected at each session. This method assumes no variability or change in competence over time. More recent studies have implemented a “benchmarking method,” which determines whether the interventionist is meeting expectations established in the protocol by specific timepoints, to assess interventionist integrity (adherence and competence; McLeod et al., 2017). However, these studies also fail to capture the trend in interventionist competence over the course of interventions. As such, no research has been found that analyzes the potential pattern of interventionist competence over the course of a school based OTMP intervention.

In addition to limited research measuring interventionist competence over time, literature from broader clinical and community sample interventions has identified specific child characteristics that may interact with initial levels or changes in competence over time. One such factor is student engagement, or the extent to which the student is both behaviorally invested in the intervention and is actively willing to participate in the sessions (Chu & Kendall, 2004). In the context of OTMP interventions, highly engaged adolescent-aged students are more likely to learn OTMP skills and are motivated to apply them (Breaux et al., 2018b). Hence, the student’s engagement throughout an intervention may be significantly associated with the ways in which interventionist competence unfolds across sessions.

Overall, minimal research has captured the unique patterns of both interventionist competence and student engagement over the course of OTMP interventions (Breux et al., 2019). As such, the study sought to examine the pattern of interventionist competence over the course of a 16-session OTMP intervention, as well as to determine whether competence interacts with student factors, such as their engagement, during OTMP interventions that ultimately influence the ways in which interventionists provide flexible responses to student needs over time.

Chapter 2: Literature Review

Attention-deficit/hyperactivity disorder (ADHD) is one of the most prevalent childhood and adolescent neurodevelopmental disorders today (Drechsler et al., 2020; Villodas et al., 2014). Core symptoms associated ADHD affect students differently and the range of impaired functioning domains make it difficult for researchers to determine a concrete prevalence rate (Drechsler et al., 2020). In addition, the previous literature surrounding heterogeneous presentations of ADHD symptoms can change over the course of an individual's childhood through adulthood, as well as gain a better understanding of evidenced-based treatment practices that address the wide-variety of ADHD symptomology. By addressing common concerns associated with ADHD in terms of symptoms, impairment, and co-occurring conditions, research can better develop school-based intervention procedures that focus on improving academic and social functioning of students with ADHD.

Attention-Deficit/Hyperactivity Disorder

Difficulties with inattention and impulsivity and hyperactivity are staple behavioral characteristics of individuals with ADHD which affects approximately 6.5% of students ages 13 to 17 years of age and can significantly impact adolescent student's academic and social performance. In addition to difficulties with inattention and hyperactivity and impulsivity, concurrent deficits may include poor control over an individual's emotions, low motivation, impaired fine motor skills, poor time management, outbursts or disruptive behaviors, and irregular sleep habits (Martella et al., 2020; Kofler et al., 2008). As ADHD individuals age, over half will continue to experience difficulties with inattention and/or hyperactivity and impulsivity, even

with the *absolute* occurrence of symptoms decreasing. In other words, while phenotypically ADHD may look different, it is a chronic condition where individuals continue to face challenges academically, socially, and behaviorally (Barkley, 2014; Martella et al., 2020).

Moreover, these challenges may present differently based on sex. Males are diagnosed with ADHD more than twice as often as females (Hinshaw et al., 2022) and typically exhibit greater hyperactivity and/or impulsivity symptoms than females. However, difficulties with inattention appears to affect all individuals regardless of sex (Loyer Carbonneau et al., 2021). Of note, more recent literature has argued that females with ADHD have historically been under-studied, which warrants further research on differences based on sex and ADHD symptoms presentation. However, barriers impacting research of females with ADHD includes reporter bias (i.e., perceiving ADHD symptoms as indicative in males only), higher diagnoses of inattentive (less observable) presentation in females, and less co-occurring externalizing behaviors reported in females (Hinshaw et al., 2022; Owens et al., 2014). Etiology and differences between sex are described in greater detail within the *Appendix*.

In school-based settings in particular, students with ADHD often exhibit higher levels of off-task behaviors than their TD classmates (DuPaul & Stoner, 2014). One meta-analytic review conducted by Kofler et al. (2008) found that students with ADHD ages 6 to 12 years exhibited off-task behaviors, on average, during 25% of their school day compared to the average 12% of time off-task exhibited by their TD peers. Engagement time was also moderated by the classroom activity and

instructional context, meaning that inattentive behaviors associated with ADHD appears to shift based on the student's individual interests within the classroom (Kofler et al., 2008). As such, academic functioning is considered one of the most prominent domains of impairment for youth with ADHD. Researchers have reported that adolescents with ADHD score significantly lower on overall grade point averages (GPA), standardized achievement tests, and are at a greater risk of grade retention and school dropout (DuPaul & Stoner, 2014; Evans et al., 2014; Kent et al., 2011).

In addition to academic challenges, adolescents with ADHD may engage in behaviors that are seen as disruptive to their classmates (i.e., calling out or responding impulsively and temper outbursts due to low frustration tolerance for assignments; DuPaul & Stoner, 2014). These disruptive behaviors often stem from difficulties with emotion regulation, which includes the students' abilities to resist the urge to immediately react to a situation, modulate emotional arousal, and re-direct attention to an appropriate situation that better aligns with social goals (Barkley, 2014). Studies have tied emotion dysregulation to individuals with ADHD such that they are more likely to exhibit impulsive behavioral responses and seek immediate gratification to which their emotional states may become over-aroused and harder to control (Drechsler et al., 2020). Although emotion dysregulation is not a formal component of the ADHD criterion, more than half of youth diagnosed with ADHD also endure challenges with managing anger, irritability, low frustration tolerance, and outbursts or tantrums (Faraone et al., 2019).

Additionally, children and adolescents with ADHD are often diagnosed with co-occurring neurodevelopmental and mental disorders which results in functional

impairments across multiple domains including academic, social, psychiatric, and personal well-being. Given that ADHD presents heterogeneously, and symptoms may be complex, screening for comorbidities when working with youth with ADHD is crucial for appropriately managing treatment. Research supports that over half of youth with ADHD diagnosed in a clinical or community setting will also be diagnosed with at least one comorbid mental health disorder which will often continue into adulthood (Molitor et al., 2019b). Research has reported that the prevalence of psychiatric comorbidity is overall higher in individuals with ADHD when compared to TD peers (Biederman et al., 2005). More recent research highlights differences based on sex in core ADHD symptoms and treatment between male and female youth (Hinshaw et al., 2022). For example, a study by Kok and colleagues (2020) found that girls with ADHD were less likely to be treated with medications than boys. Additional information regarding comorbidities associated with ADHD is described further in the *Appendix*.

ADHD Theoretical Orientation

Multiple theoretical camps of ADHD exist within the literature (i.e., cognitive dysfunction models and motivation deficit-based models; Barkley, 2014) and this study aligns best with multiple pathways models in accord with school-based ADHD interventions that combine skill acquisition to address neuropsychological weaknesses with strengthening intrinsic motivation for students for academic achievement (DuPaul et al., 2011; DuPaul & Jimerson, 2014; Pfiffner et al., 2013). Further descriptions of cognitive dysfunction and motivation deficit theoretical models of ADHD are found in the *Appendix*.

Dual Pathway Model

Given the heterogeneity of ADHD, an integrated theoretical orientation has been developed to address the multiple underlying processes driving symptoms. Proposed by Sonuga-Barke (2002; 2003) the dual pathways model of ADHD acknowledges both cognitive deficits (believed to be modulated by mesocortical dopamine) and motivational dysfunction (believed to be modulated by mesolimbic dopamine; Sonuga-Barke, 2005). This study conceptualized ADHD through this dual pathway framework. The dual pathway model suggests that ADHD symptoms are heterogeneous and are due to interacting combinations of neuropsychological weaknesses. For example, previous literature has reported that while EF deficits are commonly associated with ADHD (Roberts et al., 2017), analyses from a sample of over 1,000 ADHD participants found that less than 50% of participants exhibited clinically significant deficits in inhibitory control when measured through the stop-signal test (Nigg et al., 2005). In an additional review study conducted by Solanto et al. (2001), findings concluded that inhibitory control deficits and delay aversion in ADHD were dissociable processes, yet, when measured together, explained upwards of 85% of the variance in children with ADHD. Moreover, Sonuga-Barke (2003) found that delay aversion and inhibitory control predicted ADHD symptoms independently. Whereas some ADHD symptoms are a result of challenges with EF skills, specifically inhibitory control, research has demonstrated that not all children with ADHD exhibit the same EF skills deficits (Nigg et al., 2005; Roberts et al., 2017). Some ADHD symptoms may result from aversion to reward delay and the need for immediate gratification (Barkley, 2014; Sonuga-Barke, 2005).

The dual pathways model has served as the framework for many clinical and school-based interventions for students with ADHD such that the programs created focus on making significant improvements in cognitive processes such as planning and organization skills, as well as increasing motivational processes with motivational interviewing and goal setting in exchange for rewards (Breaux et al., 2019; Evans et al., 2018; Sibley et al., 2016). With regard to this study, interventionists who implemented intervention procedures focus on improving student motivation for homework and assignment completion while addressing skill development in specific areas of impairment such as organization and planning (i.e., specific EF skills deficits).

School-Based Interventions for Students with ADHD

Academic functioning has been well-established in literature as a challenge for students with ADHD, particularly during adolescence where expectations and responsibilities regarding schoolwork increase (Biederman et al., 2004; DuPaul & Langberg, 2014; Evans et al., 2018). Research has reported that academic functioning difficulties are often associated with EF skills deficits, even after controlling for ADHD symptom severity and intellectual functioning (Molitor, 2019b). Specifically, students with ADHD often struggle with EF skills that are related to academic success such as organizing materials, homework completion, and efficiently managing their time to meet deadlines (DuPaul & Stoner, 2014). These difficulties are associated with multiple negative academic consequences such lower cumulative GPA's, higher risk of dropout, and lower work completion. Specifically, research has

found that students with ADHD turn in assignments 15% less often than their TD peers (Kent et al., 2011).

Given the degree of persistent impairments that students with ADHD face academically, interventions within the school setting, a primary service delivery site, have been developed to address these difficulties (Evans et al., 2007). However, limited research has examined the effectiveness of empirically supported intervention strategies for adolescent students with ADHD specifically (DuPaul & Stoner, 2014). One metaanalysis conducted by DuPaul et al. (2012) found 15 studies analyzing school-based ADHD interventions for academic concerns and revealed medium to large effect sizes on proactive academic behaviors such as task initiation and completion. Recommended intervention strategies for students with ADHD may also be reported based on empirical evidence from similar at-risk populations, such as students with EF deficits but who are not diagnosed with ADHD, which aligns with the Dual Pathway model of ADHD (Roberts et al., 2017). Challenges with EF skills (e.g., organization, planning, self-monitoring) often align with behavioral challenges characteristic of students with ADHD, therefore, interventions originally intended to treat ADHD have also been found to strengthen EF skills (Molitor et al., 2019; Willcutt et al., 2005)

School-Based ADHD Interventions and Medication Use

Research from the National Survey of Children's Health (NSCH) data, which was collected in 2016, reported that over 60% of youth with ADHD use medication, which represents approximately 5.1% of youth in the United States who are diagnosed with ADHD (Danielson et al., 2018). Psychostimulant medication has been

found to improve behaviors associated with ADHD such as time-on-task, inattention, and disruptive classroom behaviors such as calling out (Kortekaas-Rijlaarsdam et al., 2019). Although improvements in academic functioning is a common treatment target for youth with ADHD, limited research has reported on short-term and long-term academic outcomes with students using ADHD medications (Currie et al., 2014).

Treatment outcomes from using medication do not always translate into improvement in academic achievement broadly (DuPaul et al., 2022; Kortekaas-Rijlaarsdam et al., 2019). For example, one systematic review by Arnold and colleagues (2020) reported that the greatest academic improvements were made when participants received both medication and behavioral treatment rather than one alone. Additionally, research conducted by Currie and colleagues (2014) reported that there has been an increase in psychostimulant use for both boys and girls with ADHD, but medication use was not significantly associated with greater test scores or academic achievement. Rather, increase in medication use was associated with greater internalizing problems for females and lower math scores for both boys and girls.

One recent randomized crossover study by Pelham and colleagues (2022) found that while medication use exhibited statistically significant effects on classroom behaviors such as time on-task and seatwork productivity, no effect of medication was reported on acquiring and retaining new material taught to students, despite students being introduced to material in small-group, evidence-based instruction. As such, researchers concluded that while medication may improve

cognitive processes associated with ADHD, the effects of medication may not have a significant impact student learning (Pelham et al., 2022).

In sum, prior research has argued that the use of psychostimulant medication is an effective treatment for adolescents with ADHD (Barkley, 2014). However, it seems that additional interventions strategies at school may best support students. Psychostimulants improve ADHD symptoms associated with inattention and hyperactivity, but medication-only treatment exhibits modest effects on EF skills (Bikic et al., 2017). Additionally, few studies have analyzed the relationship between medication and organizational skills specifically and most reported very small effect sizes (Abikoff et al., 2009). Whereas core ADHD symptoms may be addressed through medication, difficulties with EF skills such as planning may remain, which warrants additional treatment such as organizational skills interventions (Wennberg et al., 2018).

Behavioral and Academic Strategies for Students with ADHD

Given the complex student factors that may affect treatment outcomes, beyond the use of psychostimulants, intervention strategies for adolescents with ADHD consist of both behavioral and academic domains. Behavioral strategies for adolescents with ADHD focus on decreasing unwanted behaviors by modifying the student's environment or academic setting. Behavioral strategies may include posting clear and concise classroom rules in an easily accessible location, providing descriptive praise for desired behaviors, reducing task demand or length of assessment time, and providing students with task choices on assignments (DuPaul et

al., 2011). In addition, strategies such as organization and planning skills training are incorporated into behavioral interventions (Molitor et al., 2019a).

Whereas behavioral interventions focus on personal or individual strategies to reduce undesired behavioral responses, academic interventions focus more on broader classroom strategies and ways to improve overall academic functioning. Academic strategies include techniques such as coaching students one-to-one to establish academic goals, peer and parent tutoring, modifying task instructions, note-taking training, teaching study skills, using a homework agenda to track work and deadlines in one location, and utilizing tools such as computer-assisted instruction (CAI; Daley & Birchwood, 2010; DuPaul & Stoner, 2014). In addition, academic and behavioral strategies often overlap such that students learn specific academic skills while working towards modifying their behavior to reach set goals.

One commonality between behavioral and academic strategies for adolescents with ADHD is that both focus on skill building to accommodate for cognitive deficits in organization, time management, and planning, or OTMP skills. Specifically, deficits in OTMP skills are tied to EF skill impairment including challenges with working memory, inhibiting dominant responses, and attention. These challenges can interfere with higher-order EF skills such as planning for due dates and organizing materials for future tasks (Abikoff et al., 2013; Barkley, 2014). As such, interventions focused on OTMP skills are crucial for students with ADHD to make improvements in their primary domain of difficulty: academic functioning (Abikoff et al., 2013; DuPaul & Langberg, 2014; LaCount et al., 2018). OTMP skills training includes working directly with students to increase organizational strategies and homework

completion tactics needed over extended time periods. Improvements in academic functioning prevent academic decrement that students with ADHD often face as they enter secondary school and their academic work becomes increasingly more complex (DuPaul et al., 2021).

OTMP Interventions within Clinical and School Contexts

Interventions focusing on OTMP skills have been developed for students ranging from elementary-age through college-age and OTMP skills training has been reported to be as effective as cognitive-behavioral treatment in changing student behaviors for greater academic organization skills (DuPaul et al., 2012). Additionally, research supports effective OTMP interventions both in clinic-based settings (i.e., after-school programs in a research lab) and school-based settings (i.e., incorporated into the school day). However, while clinical research has supported multiple OTMP interventions (Abikoff et al., 2013; Sibley et al., 2014; Solanto et al., 2001), fewer studies have specifically examined school-based OTMP interventions (Gureasko-Moore et al., 2006).

As previously mentioned, features of OTMP interventions include but are not limited to introducing students to new skills weekly as well as tasking students to regularly record assignment due dates in a central location, utilizing a binder to organize school papers and intervention checklists, and tracking the amount of time required for work completion (Abikoff et al., 2013). Additional elements of OTMP interventions can include daily report cards, where students receive check marks throughout sessions and track their progress (Bikic et al., 2017), as well as incorporating a contingency management system (e.g., token economy), where

students are able to self-monitor and track their progress throughout the intervention when using the OTMP skills (Breux et al., 2018a).

Clinic-Based OTMP Interventions

Prior studies examining OTMP interventions within a clinical setting have typically administered OTMP sessions after school within a research lab context. Clinical OTMP intervention sessions have been reported to run from 60 to 90 minutes each. The number of sessions has ranged from three, one-hour long sessions (LaCount et al., 2018) to eight, 90-minute sessions (Sibley et al., 2014), to a 14-month, clinic-based treatment phase (MTA Cooperative Group, 1999).

Clinic-based OTMP intervention findings have reported significant improvements in students' assignment completion and class attendance, as well as decreased ADHD symptom severity with regard to inattention and hyperactivity/impulsivity (MTA Cooperative Group, 1999; LaCount et al., 2018; Solanto et al., 2001). Other studies have found significant increases in student self-reported satisfaction with regard to their organizational skills progress (Sibley et al., 2014), as well as increases in parent and teacher-reported organizational skills and time management measures (Abikoff et al., 2013). Interestingly, fewer studies have focused on treatment outcomes of adolescent-age students with ADHD than outcomes for college students and elementary students with ADHD (Evans et al., 2007). As such, it is important to explore the impact of OTMP interventions specifically on adolescents with ADHD as findings can reveal specific aspects of OTMP interventions leading to greater academic success for this age group.

School-Based OTMP Interventions

Given that students spend significant portions of their day in educational settings, schools are one of the best locations to receive interventions addressing OTMP skills (DuPaul et al., 2012; Evans et al., 2014). Over half of students diagnosed with ADHD have also received mental health services for their disorder while in school (Pfiffner et al., 2016). Benefits of school-based interventions include higher convenience and easier accessibility to families, as well as targeting academic functioning challenges during the school day rather than recalling the challenges later in a clinical context (Biedas et al., 2012; Evans et al., 2007). Additionally, clinical-based interventions are often longer than school-based OTMP sessions and may be completed by a clinician who has never previously met the student. As such, rapport building and establishing a partnership may be more challenging as opposed to school-based OTMP interventions with staff members who may have pre-existing partnerships with students to incorporate session content into the school day (Pfiffner et al., 2014). In research studies, staff members involved in delivering OTMP interventions are trained to deliver the intervention program as specified.

Generally, research has found that school-based OTMP interventions improve organizational problems and parent-reported ADHD symptoms in both elementary- and middle school-aged students. In a meta-analysis conducted by Bikic and colleagues (2017), OTMP interventions also yielded a modest effect size on academic performance, suggesting that these interventions may also be beneficial for improving overall academic performance for students with ADHD. Moreover, DuPaul and colleagues (2022) conducted a recent review of school-based ADHD treatment strategies including organizational skills interventions. Authors highlighted the

effectiveness of manualized OTMP interventions and short- and long-term improvements in organizational skills and homework management for students with ADHD. However, it is important to note that the review also highlighted challenges with school-based OTMP programs such as collaboration and acceptability from the staff of these interventions within school setting. For these reasons, DuPaul also reported in an earlier review in 2020 that despite modifications being made to include participation from families, pediatric providers, and schools, researchers struggle to implement programs in educational settings (DuPaul et al., 2020).

Adolescents with ADHD may especially benefit from OTMP interventions given that students face many new challenges when entering secondary school. Adolescents with ADHD may face academic difficulties such as more complex subject matter, increased independence from their teachers and parents, greater expectations to pay attention in multiple classes, and independently planning out and completing multi-step, long-term assignments (DuPaul et al., 2021; DuPaul & Stoner, 2014). As a result, some researchers have developed OTMP interventions specifically to be administered in the school setting, while others have adapted pre-existing OTMP interventions originally developed within a clinic to be applied to the school context (Storer et al., 2014).

School-based OTMP interventions are similar in session content when compared to clinical OTMP interventions, but schools often endorse briefer sessions due to the limited time and resources allotted during the school day. While sessions may be shorter in time, previous research has determined similar effectiveness of OTMP interventions in schools versus clinical settings. Medium effect sizes for

significant differences in organization and time management, homework problems, and inattentive symptoms when compared to a control group have been reported in school based OTMP interventions (Evans et al., 2016). Additionally, another school-based OTMP intervention was associated with significant decreases in ADHD symptom severity and significant increases in organizational functioning (as rated by the parent report of the Children's Organizational Skills Scale), and teacher-rated academic performance (as rated by the Academic Competence scale on the Social Skills Improvement System; Pfiffner et al., 2013). Finally, one meta-analysis that analyzed 12 organizational skills studies with school-aged students (ages 5-18) with ADHD reported moderate improvements in teacher-rated organizational skills and large improvements in organizational skills as rated by parents post interventions (Bikic et al., 2017). Of the 12 studies reviewed, half focused on adolescent-age students with ADHD specifically.

School-based OTMP intervention sessions range from 8 (Pfiffner et al., 2007; 2014) through 18 (Evans et al., 2007; 2016; Langberg et al., 2011; 2018) weekly meetings and occur anywhere from 20 to 40 minutes and take place in both individual and group session formats. Similar to clinic-based OTMP interventions, multicomponent school-based OTMP sessions include teaching adolescents with ADHD study skills (e.g., note-taking and summarizing techniques), organizational skills, developing home routines, and discussing topics such as homework completion and social problem solving. In addition, few school-based OTMP interventions incorporate parent and teacher-only sessions which include group parent training, teacher consultation, and child organizational skills and social skills training. Teacher

consultation meetings consist of interventionists reviewing contingency management plans (e.g., token economies or a daily report card where the student tracks their behavior) with the teacher, as well as teachers recalling classroom accommodations and challenges faced by the student that week (Pfiffner et al., 2014). One intervention study has also randomized participants into a mentor experimental group, which consisted of a trained teacher or research team member serving as a weekly mentor to the student (Pfiffner et al., 2014).

Of note, this study utilized data collected from a school based OTMP intervention titled, “Homework, Organization, and Planning Skills” (HOPS; Langberg et al., 2017). Findings reported that adolescents with ADHD completing HOPS made significant improvements based on parent-reported homework completion and organization and planning skills (effect sizes range from 0.8–1.29) and moderate (effect size = .55) teacher-reported improvements to organization skills and grade point averages (Langberg et al., 2017). The HOPS intervention is typically provided in schools and is primarily conducted with middle school students across 16 weekly individual sessions during the school day. Detailed descriptions of HOPS intervention sessions are found in the methods section.

The Role of OTMP Interventionists

It is important to note that for OTMP sessions to be successful and incorporate the key features previously described (i.e., skill development and progress monitoring), interventionists must be trained to provide OTMP intervention session content with fidelity. Additionally, OTMP interventionists may have to collaborate with parents and /or teachers to ensure that skills and strategies are being

implemented at home and at school (Breux et al., 2021; Pfiffner et al., 2014).

Interventionists play key roles in OTMP interventions for students with ADHD by 1) providing students with reviews of skills they have learned and 2) motivating and reinforcing consistent OTMP skills practice so that students incorporate their skills into their daily routines (Abikoff et al., 2013; Evans et al., 2011; Sibley et al., 2016).

While some students with ADHD can easily acquire the knowledge about organizational skills, they may lack the motivational processes to consistently utilize the skills throughout their daily routines. Deficits in motivational processes may result in delay aversion, or the tendency for students to seek immediate positive outcomes as opposed to incorporating skills into academic task completion for longer periods of time (Sonuga-Barke, 2005). As such, it is critical that school mental health providers (e.g., school psychologists, school counselors, and special educators) who typically serve as OTMP interventionists are prepared to deliver the intervention with fidelity and receive adequate consultation to teach and support students participating in OTMP interventions and additional stakeholders involved (DuPaul & Stoner, 2014).

While the overarching goals of OTMP interventions are to improve the academic functioning and organizational skills of students with ADHD through brief, skills-based sessions that motivate students to implement strategies during their school days, few researchers have explored the effects of the interventionist training and implementation on intervention outcomes. Generally, research supports that supervision and quality training of evidence-based treatment is crucial for optimizing standardization and treatment fidelity of interventions (McLeod et al., 2017). For

example, one study reported that school-based, self-reported interventionists' attitudes (measured by the Evidence-Based Practice Attitude Scale) positively affected their adherence to delivering CBT to students ages 8-17 with anxiety (Beidas et al., 2012). A second article reviewed the extent to which interventionists received case-centered consultation when implementing school-based interventions to individual students and highlighted factors influencing interventionists' behavioral changes such as the frequency and quality of consultation, educational context, interventionists' professional status, and personal accountability (Noell & Witt, 1999). However, fewer studies have examined interventionist training and implementation affecting treatment outcomes of school-based OTMP programs specifically. One study, conducted by Breaux et al. (2021), examined whether clinician characteristics (e.g., adherence, working alliance, and competence; further described below) predicted treatment outcomes of adolescents with ADHD completing homework and organization skills interventions in school. Findings revealed that higher clinician competence, as measured through independent observation coding of interventionist responses (similar to this study's procedures), predicted fewer post-treatment parent-reported organizational problems and a greater percentage of assignment completion.

Training OTMP Interventionists

Many OTMP interventions for students with ADHD both in clinic-based and school-based settings include procedures where interventionists receive an initial training preceding the implementation of the OTMP intervention, followed by briefer consultation sessions throughout the course of the intervention. Interventionists are

often reported as masters-level school mental health providers (Langberg et al., 2011; Pfiffner et al., 2013; Sibley et al., 2016). However, training procedures for OTMP interventionists vary across studies in terms of involvement and formal supervision or consultation from researchers.

For example, one school based OTMP intervention program offered weekly group and individual supervision where audio and videotapes of sessions were reviewed (Pfiffner et al., 2013). Another study reported monthly consultation meetings between a trained OTMP interventionist (i.e., teacher, administrator, school counselor, or special educator) and a school consultant (i.e., one master-level school social worker and one school psychologist) who oversaw the intervention progress at the school (Sibley et al., 2016). Other school based OTMP interventions implement one initial, detailed training and practice with manualized materials but do not include formal behavioral consultation meetings post-training (Langberg et al., 2012). Finally, interventionists may receive different training based on the experimental group assignment of either an after-school program or a mentor-based OTMP intervention (Evans et al., 2007). Indeed, the ongoing support and guidance that interventionists receive may impact their behaviors and orientations towards the procedures and therapeutic processes of treatment (Hogue et al., 2008; McLeod et al., 2017).

Treatment Integrity

Analyzing the degree to which interventionists abide by treatment protocols and implement the intervention as planned is often referred to as treatment integrity (Gresham et al., 1993; Fiske, 2008). Within the context of OTMP interventions,

treatment integrity often relates to the extent to which interventions accurately provide high quality OTMP skills training to participants. Treatment integrity, also known as implementation fidelity, is important to consider when evaluating evidence-based interventions because it has been linked to the effectiveness of interventions based on participant outcomes (Goense et al., 2016; McIntyre et al., 2007). Moreover, measuring the ways in which interventions are delivered as intended is critical as the data acts as a feedback mechanism for researchers and interventionists alike. Data can be used to inform the ways in which interventions are generalized, as well as methods through which future interventionists are selected, trained, and supervised throughout treatment (Breitenstein et al., 2010). However, very few studies report how they monitor treatment integrity, especially within the context of school-based interventions, which limits the understanding of the relationship between interventionist treatment integrity and change in participant target behaviors (Gresham et al., 1993; McIntyre et al., 2007). In addition, interventions that are developed in highly structured, clinical settings may not succeed when generalized to real-life contexts such as schools due to confounding factors possibly affecting interventionist treatment integrity (Breitenstein et al., 2010; Perepletchikova et al., 2007).

Previous studies have consistently agreed that, in general, higher levels of treatment integrity, or implementing the intervention as instructed, are related to greater behavioral changes and treatment outcomes (Breitenstein et al., 2010; Goense et al., 2014). For example, a review conducted by Gresham et al. (1993) determined that treatment integrity was moderately correlated to treatment outcomes ($r = .51$ for

group studies; $r = .58$ for single-subject design studies). Treatment integrity has also been found to significantly improve when interventionists receive consistent performance feedback on treatment implementation as opposed to receiving more traditional didactic instruction regarding intervention procedures (Fiske, 2008; Hogue et al., 2013). Additionally, opportunities for role playing various situations during practice prior to administering intervention materials (Goense et al., 2014) as well as operationalizing treatment components with interventionists (Collier-Meek et al., 2018) have also been found to improve treatment integrity.

Some researchers have stated that specific dimensions of treatment integrity should be considered quality indicators of treatment implementation for evidence-based treatments such as OTMP interventions (McLeod et al., 2013; Hogue et al., 2008). These specific dimensions include interventionist adherence and interventionist competence which are further described below. It is important to note that research has substantiated that the two components of treatment integrity capture different processes and should not be substituted with one another (Perepletchikova & Kazdin, 2005; Breaux et al., 2021). As such, it is possible for some interventionists to exhibit high adherence to protocols while failing to adjust their use of techniques to the participants' needs (i.e., low program-specific competence), while other interventionists may express greater degrees of responsiveness to students but stray away from intervention procedures (i.e., low adherence). While both interventionist adherence and competence are specific dimensions of treatment integrity, each has been considered a unique predictor of treatment effectiveness (Collyer et al., 2020; Webb et al., 2010).

Interventionist Adherence

The specific dimension of treatment integrity known as interventionist adherence refers to the interventionist's fidelity to the intervention's procedures (Breitenstein et al., 2010; Perepletchikova et al., 2007). In other words, measures of interventionist adherence assess the degree to which interventionists execute procedures per the intervention's protocol (Hogue et al., 2008). The most common methodologies used to examine adherence include quantitative measures, such as checklists, which are specifically created based on the intervention. The checklist items indicate whether the interventionist followed the manualized procedures or not. As such, ratings are often recorded through yes or no responses to measure the presence or absence of prescribed strategies defined by the intervention manual (Breitenstein et al., 2010). Checklists may be completed by both interventionists or trained observational coders who review session videos and audiotapes.

A second method for measuring treatment adherence is through observational coding conducted by research team members. Coders rate interventionist adherence by reviewing audio and/or video recordings of sessions and use a seven-point rating scale to report the degree to which interventionists conformed to the intervention protocol. Codes are also provided based on aspects of adherence such as whether or not interventionists delivered standard components of an intervention (i.e., general CBT framework) as well as session-specific content that may be exclusive to and essential for the intervention (Bjaastad et al., 2016; Southam-Gerow et al., 2016).

Previous research has found that interventionist adherence significantly predicted treatment outcomes in clinical settings but very few studies have explored

the effect of interventionist adherence on school-based intervention outcomes (Breux et al., 2021; McIntyre et al., 2007). For example, clinic-based studies have found that higher therapist adherence to therapeutic strategies is associated with significant improvements in internalizing and externalizing symptoms in individuals ages 12-17. Specifically, one study examined the adherence to therapeutic strategies associated with Brief Strategic Family Therapy including the four domains of the therapeutic modeling: joining, tracking and diagnostic enactments, reframing, and restructuring (Robbins et al., 2011, p. 5). Another study conducted by Hogue and colleagues (2008) reported adherence to individual Cognitive Behavioral Therapy (CBT) and Multidimensional Family Therapy (MDFT) which includes but is not limited to techniques such as increasing proactive behaviors while decreasing problem behaviors, self-monitoring, strengthening problem-solving skills, and addressing cognitive distortions. Regardless of the therapeutic approach, stronger adherence was found to predict improvements in symptoms.

A recent metanalysis also found a small yet statistically significant relationship between therapist adherence and participant outcomes after adolescents received clinic-based, outpatient psychosocial interventions (Collyer et al., 2020). Moreover, Barber et al. (2006) found a curvilinear relationship between adherence and treatment outcomes such that intermediate levels of adherence were associated with the most positive treatment outcomes. Additionally, low and high levels of adherence were associated with worse outcomes, suggesting that interventionists should be trained to adhere to the specific intervention strategies while also exhibiting flexibility in their responsiveness to participants to ensure the intervention is

implemented (i.e., program-specific competence; Barber et al., 2006). Hence, the specific dimension of treatment integrity, adherence, plays a role in adolescent therapeutic practice.

Previous research has typically focused more on adherence than competence when predicting treatment outcomes. Some researchers believe that because adherence is often measured quantitatively (e.g., dichotomous checklists) and because competence is measured as a qualitative judgement of therapeutic processes, that competence is expected to have greater variability when operationalizing than adherence (McLeod et al., 2018). As such, past research has focused more on adherence when predicting treatment outcomes. Additionally, studies typically subsume competence and adherence into the broader construct of treatment integrity and do not always disaggregate the two separate processes.

Interventionist Competence

The second specific dimension of treatment integrity is interventionist competence, which captures the interventionist's quality or skillfulness of their implementation procedures. Of note, this review differentiates competence from working alliance. Working alliance has been described by research as the bond formed between the interventionist and student within the context of working collaboratively on therapeutic tasks (Beaux et al., 2021). Competence emphasizes the interventionist's responsiveness and capabilities when responding to specific needs or factors of the student that may impact their performance in the intervention. Whereas competence focuses on the characteristics of *interventionists* alone, working alliance places greater emphasis on the *bond* or relational components that the interventionist

and student share. However, prior literature has reported that treatment integrity measures (i.e., adherence and competence) have been associated with alliance when predicting treatment outcome (Barber et al., 2006; McLeod et al., 2018).

Researchers have proposed two key aspects of interventionist competence as interventionists develop skills both at an interpersonal level and at a more global, processing-level (McLeod et al., 2013). One aspect of competence, called “program-specific” or “technical competence,” captures the quality of implementation of manualized procedures. Program-specific competence focuses on intervention procedures or activities that are unique to a specific intervention. The other aspect of competence referenced in research, “non-specific” or, “relational” competence, focuses on the flexibility of the interventionist in responding to the student and on the relationship established. The interventionist’s responses may also be reciprocally influenced by their prior training in relational skills and/or the student’s reactions to intervention procedures. These interactions between the student and interventionist are considered transactional as characteristics of both student and interventionist affects the types of competence skills used (Leve & Cicchetti, 2016). In other words, program-specific competence focuses on the interventionist providing the intervention well, whereas non-specific competence focuses on the interventionist’s responsiveness to students during the intervention through using relational or therapeutic strategies to successfully introduce skills (McLeod et al., 2013; 2018).

Program-Specific Competence versus Non-Specific Competence. Program-specific interventionist competence focuses on *how well* the interventionist delivers session content specific to the intervention (Breitenstein et al., 2010; McLeod et al.,

2018). Unlike non-specific competence, therapeutic processes are not associated with program-specific competence but rather the effectiveness of the interventionist delivering materials. As such, program-specific competence can also be considered the quality of the interventionist's adherence to the intervention (McLeod et al., 2013).

Non-specific competence is not tied to a particular model or intervention and encompasses relational qualities of interventionists, which has led to challenges when accurately measuring this type of competence (Goense et al., 2014; Webb et al., 2010). Additionally, within clinic-based studies, researchers use the term, “therapist flexibility,” or relational factors including therapist level of responsiveness and adjusting to student needs “within the boundaries of treatment fidelity” as a proxy for non-specific competence (Chu & Kendall, 2009, p.738). Characteristically across treatment settings, non-specific competence is more qualitative, involving therapeutic skills that subsume interventionists' abilities to effectively communicate with and provide interventions to students. The study focused on *non-specific* competence rather than *program specific* competence as the former has been understudied in research on the quality of implementation of intervention materials, which has generally emphasized program-specific competence (Goense et al., 2014; McLeod et al., 2018).

Measuring Interventionist Competence. Given that competence is considered a qualitative construct with different types of both program-specific and non-specific conceptualizations, researchers have measured it in a variety of ways. Measures of program-specific competence focus more on the interventionist's ability to keep

sessions focused on the manualized content and the skills being introduced to participants, as well as the timing in which interventionists apply these skills (Perepletchikova & Kazdin, 2005). Non-specific measures of competence often aim to capture the responsiveness and the quality of interventionists' interactions with the student(s) participating in a treatment (Goense et al., 2018; McLeod et al., 2017). Additionally, therapeutic skills typically measured when rating interventionist competence within the non-specific context include themes of vocal animation and excitement, vocal relaxation, empathy, promoting a collaborative relationship, and positivity, encouragement, and motivation (Breux et al., 2021; McLeod et al., 2018).

Similar to measuring interventionist adherence, competence can be measured through direct methods such as observational coding, where trained coders review audio and/or video recordings of sessions and rate how well interventionists delivered intervention procedures, as well as their skillfulness in using methods from their training on a Likert scale (Goense et al., 2018; Mathieson et al., 2009). Observational coding can be used to measure the overall quality of intervention delivery, or specifically measure the two types of competence (program-specific and non-specific). Currently, six known observational coding measures have been established to assess competence (McLeod et al., 2018). All the measures specifically focus on interventionist program-specific competence, particularly when implementing CBT or similar manualized therapy approaches (Bjaastad et al., 2015; Hogue et al., 2008). While some items on these observational coding measures refer to therapeutic processes (i.e., how well the interventionist collaborated with the participant), no empirically supported measures have been designed to assess non-specific

competence. Additionally, observational coding of interventionist competence has been found to be more accurate than self-reports as coders provide more objective assessments of interventionists' and participants' responses to specific session content (Breitenstein et al., 2010).

Indirect methods, or assessments (i.e., interviews or questionnaires) developed by researchers have also been used to capture the global abilities of the interventionist's responsiveness and quality of intervention delivery (Blackburn et al., 2001; Goense et al., 2018; Hogue et al., 2008; McLeod et al., 2017). Rating scales have also been divided into the two types of competence to capture the extent to which interventionist engaged in intervention procedures (i.e., agenda setting, eliciting feedback; program-specific competence), or used interpersonal skills (i.e., empathy, interpersonal effectiveness; non-specific competence). While indirect methods have been found to be simpler to use and more cost-effective, they are more prone to limitations including greater sensitivity to observer bias. Additionally, self-reports are more likely to be higher in social desirability ratings. For example, one study found that therapists who self-reported their overall treatment integrity ratings (adherence plus competence) indicated significantly lower validity than non-participant observational ratings completed by third party research team members or coders (Goense et al., 2018; Hogue et al., 2013).

OTMP Interventionist Competence and Adherence. In addition to OTMP interventions using multiple methods to train interventionists, the ways in which interventionists implement OTMP interventions have also varied in terms of consistency and treatment integrity (Evans et al., 2007; Sibley et al., 2016). As

previously mentioned, only one known study to date measures and examines interventionist non-specific competence and adherence as predictors when providing an OTMP intervention to students with ADHD specifically (Breux et al., 2021). Interventionist adherence was measured through a checklist based on the intervention details and was completed by two observational coders for each session. The checklist included six to nine items (depending on the goal of the specific session) that asked raters to indicate whether or not the interventionist followed procedures detailed in the intervention manual (i.e., “did the interventionist review the Materials Organize Plan - yes/no?”). Interventionist competence was also measured by observational coding and focused on non-specific competence, such as interpersonal effectiveness and understanding of the student’s needs (formatting based on work such as Blackburn et al., 2001). Results indicated that interventionist adherence did not significantly predict teacher or parent-reported outcome measures (i.e., organizational difficulties, percentage of assignments turned in), while interventionist competence did. Specifically, non-specific competence predicted both parent-rated organizational problems ($\beta = -0.40, p = 0.03$) and the percentage of assignments turned in post-intervention ($\beta = 0.30, p = 0.01$; Breux et al., 2021). In addition, there was an inverse relationship between non-specific competence and adherence such that interventionists who adhered to treatment procedures less were more likely to be rated higher in competence.

Results suggests that interventionists high in competence may exhibit greater self-confidence in their abilities to adjust to individual students and strengthen treatment outcomes as opposed to weakening them. Highly competent OTMP

interventionists were more likely to work with students who had higher homework completion rates post-intervention as well as higher parent-reported organizational skills scores, which was true even after controlling for adolescent baseline functioning and sex. In all, the study suggested that non-specific competence is a unique predictor of treatment outcomes above and beyond the influence of other therapeutic variables (Breux et al., 2021). As such, examining interventionist competence rather than adherence may help researchers to recognize the importance of the quality of interventionist interactions with students completing OTMP interventions, rather than focusing solely on adherence to procedures.

Student Factors Affecting OTMP Interventions

In addition to reviewing the ways in which interventionists deliver session materials, it is also important to address the students receiving the intervention. Research has established that students with ADHD often exhibit significant impairment in academic performance, such as lower test scores, incomplete homework or assignments, and greater attrition rates (DuPaul & Stoner, 2014; Kent et al., 2011; Sibley et al., 2019). Fortunately, OTMP skills training interventions have been developed to address these challenges, and empirical evidence has reported that OTMP interventions are effective in combating academic impairment (Evans et al., 2016; Langberg et al., 2017; Pfiffner et al., 2016). However, a variety of student characteristics may interact with the ways in which individual students respond to OTMP interventionists and school-based OTMP intervention session materials. Factors include but are not limited to level of student engagement, ADHD symptom severity, the presence of comorbid psychopathology, and organizational skills when

entering the OTMP intervention. Each student factor is described in greater detail below.

ADHD Symptom Severity

Prior literature has reported that generally students with greater symptom severity (i.e., ADHD combined presentation) are more likely to exhibit greater challenges with controlling behavioral responses (i.e., remaining seated; Murphy et al., 2002). Additionally, researchers have also reported that males with ADHD are more likely to display more ADHD symptoms at a greater severity (combined presentation) than females (Hinshaw et al., 2022; Owens et al., 2014). Behavioral challenges resulting from core ADHD symptoms could impact the extent to which the student participates in components and activities associated with school based OTMP interventions. Symptom severity may also interact with varying degrees of interventionist flexibility (i.e., non-specific competence) towards individual students with greater behavioral challenges. Additionally, students with ADHD are likely to present with more organizational difficulties than non-ADHD students, which are especially apparent during middle school (Evans et al., 2016). As such, different degrees of organizational problems may contribute to the ways in which interventionists respond to students when presenting session materials. No research has reported the influence of baseline student organizational problems or baseline behavioral problems on either treatment outcomes or aspects of treatment integrity such as competence.

Psychopathology

While symptoms of ADHD have been significantly associated with challenges in the academic domain of functioning (Smith et al., 2020), co-occurring disorders have also been found to affect academic performance and may impact OTMP-skills based intervention performance. For example, Lindsey et al. (2019) reported that students at risk for behavior problems completing a school-based, manualized prevention intervention (Coping Power) found that externalizing concerns were associated with less student engagement in school-based intervention procedures. Specifically, higher levels of initial externalizing behaviors were associated with less engagement in the intervention by the middle point.

Additionally, rates of comorbid externalizing behavior problems, specifically ODD and CD, can be as high as 55% for children and adolescents with ADHD and between 12-50% for internalizing problems (i.e., anxiety or depression; Gnanavel et al., 2019). The array of symptom presentation associated with different comorbidities may impact the ways in which interventionists respond to different student behaviors across intervention sessions. As such, it is important to consider the ways in which comorbid disorders, specifically externalizing disorders, may affect the ways in which students with ADHD begin to engage and remain engaged throughout school-based interventions, as well as the ways interventionists respond to their behaviors.

Student Engagement

Another well-researched student factor is the construct of student engagement, or the degree to which the student is *actively* involved and participating in intervention activities (Chu & Kendall, 2004). Multiple techniques have been incorporated into both clinical and school-based interventions such as goal setting

(Pfiffner et al., 2014), token systems or reward charts (Breaux et al., 2018a), and motivational interviewing (Sibley et al., 2016) to help students with ADHD remain focused and oriented to intervention materials.

The student's level of engagement is often individualistic and is an essential, personal characteristic to consider when implementing intervention activities. In other words, it is important to note that students who start an intervention may enter sessions initially with varying levels of interest, motivation, and opposition to certain activities (Jungbluth & Shirk, 2009). Previous research has also conceptualized student engagement as a construct that subsumes behavioral and attitudinal dimensions. For example, student engagement consists of behavioral responses such as actively attending to tasks that are necessary to reach treatment goals. Student engagement also comprises perceptions of the intervention such as the belief that the treatment is "worth it" and the emotional investment in success over time (Staudt, 2007). This study used the following operational definition to capture the construct of adolescent student engagement: "*active participation in direct therapeutic activities during the intervention*" (Breaux et al., 2018b p. 428).

Researchers have established that student engagement is a robust predictor of treatment outcomes and is significantly associated with symptom improvements post-intervention (Staudt, 2007). In a meta-analysis of 10 clinical treatment studies conducted by Karver et al. (2006), researchers found that student eagerness to participate and engagement in the session content was moderately related to treatment outcomes (mean effect size = .27). However, mixed findings have been reported when determining the timepoint of the interventions in which student engagement

significantly predicts outcomes. For example, some research has reported that initial or anticipated levels of engagement (specifically within the first three sessions) predicted greater symptom improvement post-treatment (Harrison et al., 2019), while other researchers determined that student engagement at the mid-way point of the treatment, not initial engagement, predicted lower symptom severity at the conclusion of the treatment (Chu & Kendall, 2009). Similarly, one school-based study examining the Coping Power program found that student engagement at the middle timepoint of the intervention was negatively associated with post-intervention externalizing behaviors such that highly engaged students exhibited greater decreases in externalizing problems immediately following the Coping Power program (Lindsey et al., 2019). As such, examining student engagement over the course of interventions rather than at specific time points may support researchers in identifying the pattern of stability or variation in student engagement over time and the ways that patterns may affect the student's overall treatment progress.

As previously mentioned, research focusing on student engagement in school-based studies has also reported mixed findings. For example, students who were reported by interventionists to be highly engaged in school based OTMP intervention sessions were also more likely to exhibit greater academic impairment than disengaged students (Breux et al., 2018a). Specifically, the study reported that highly engaged students were more likely to have lower teacher-reported homework completion ratings (i.e., percentage of assignments turned in) and lower GPA post-treatment. However, a later study using the same sample found that highly engaged students with greater academic challenges were also associated with the greatest

changes in academic performance post-intervention (Breux et al., 2021). Findings suggested that students who are both initially engaged in school-based interventions and have more academic challenges make the largest academic gains post-treatment, yet it is unknown whether engagement levels significantly vary or remain stable across the school-based intervention.

Previous literature measuring student engagement has often captured the construct using either a single-item measure completed by the interventionist where “engagement” has been operationally defined (*see above*; Breux et al., 2018b), or through a brief rating scale completed by observational coders. Both single-item measures and observational methods typically report student engagement on rating scales (five to seven points) ranging from 1 (not at all engaged; monotone; blank affect) to the highest unit on the rating scale (highly engaged; animated; enthusiastic). Specific items on the brief rating scales included prompts measuring the extent to which the student “participated in the interaction” (Breux et al., 2021; Chu & Kendall, 2004; Karver et al., 2008). As previously stated, this study adhered to the single-item, direct behavior rating method (Breux et al., 2021; Fabiano et al., 2017) to measure overall engagement and operationally defined the construct of student engagement as the, “*active participation in direct therapeutic activities during the intervention*” (Breux et al., 2018b p, 428).

Research examining the ways in which student engagement occurs over the course of interventions is scarce. Only one clinic-based study has analyzed the trajectory of student engagement through observation coding over the course of a CBT treatment for anxiety (Hudson et al., 2014). Authors found that the trajectory of

student engagement followed an inverted-u pattern, suggesting that students become increasingly more engaged during the first few CBT sessions, reach a peak during the middle sessions, and gradually become less engaged towards the end of the CBT treatment (Hudson et al., 2014).

Research exploring the effect of student engagement on school-based interventions over time has not been studied. It is likely that students exhibit varying degrees of engagement over the course of interventions such that some students may present as readily engaged and remain involved in their treatment, whereas other students may find it harder to maintain their focus and express difficulty engaging in the intervention throughout sessions. This may be especially true for students with ADHD who, unlike anxious or depressed youth without ADHD, are more likely to struggle with paying attention to intervention activities, responding impulsively based on their emotions, and remaining motivated to reach intervention goals. As such, exploring to what extent student engagement varies or remains stable across school-based intervention sessions for students with ADHD may help researchers determine when engagement-promoting techniques should be incorporated into intervention protocols.

Non-Specific Competence and Student Engagement. Limited research has examined the relationship between student engagement and interventionist non-specific competence. One clinical study found that interventionist competence (defined as “therapist flexibility” in the study) measured at an initial CBT session for depressed adolescents predicted student engagement in the remaining CBT sessions (Jungbluth & Shirk, 2009). Therapist flexibility was measured through an

observational coding system (the Adolescent Alliance Building Scale; Shirk et al., 2003) and captured relational behaviors comprising non-specific competence including expressing positive regard, exploring motivation, and responsiveness to uniquely student needs. However, these studies have used overall mean ratings to predict change, rather than examining whether non-specific competence or student engagement changed over time.

To date, the single study to have examined the mean growth trajectories or changes in child engagement and interventionist non-specific competence over time found that both student engagement and interventionist non-specific competence exhibited a concave quadratic curve pattern, or an inverted-u shape, indicating a rise, peak, and fall in both constructs over the course of 16 CBT sessions (Hudson et al., 2014). Researchers also reported a small but significant, positive relationship between student engagement and competence early in therapy. While this study stressed the importance of maintaining high engagement initially for clinical improvement, no research has explored the stability or variation in neither student engagement nor interventionist non-specific competence within the context of school-based interventions for adolescents with ADHD.

In sum, it is unknown whether student engagement aligns with interventionist competence over time in school-based interventions. Additionally, no known studies have determined the possible pattern or the “ebb and flow” of neither non-specific competence nor student engagement within the context of OTMP interventions. As such, examining the session-by-session ways in which interventionists respond therapeutically to participants, as well as how actively involved students remain over

the course of the intervention may help researchers to better understand and identify key ingredients to OTMP intervention success. Identifying critical features of successful interventionist social exchanges with students participating in the intervention can better inform the nature of interventionist training. Researchers may also be able to identify the most effective ways of implementing OTMP session content and determine specific feedback that interventionists could benefit from hearing during supervision or consultation meetings (Bjaastad et al., 2016; Collyer et al., 2020).

The Present Study

Empirically supported, school-based interventions addressing difficulties in organization, time management, and planning skills (OTMP) have been established to provide adolescents with ADHD direct support and strategies that target organizational skills and homework completion (DuPaul et al., 2021). Trained OTMP interventionists are expected to implement intervention curriculums with high treatment integrity, which requires interventionists to follow the intervention manual (adherence) and to be flexible in responding to student needs across intervention sessions (non-specific competence; Goense et al., 2014; McLeod et al., 2013). Higher interventionist adherence and non-specific competence are both associated with greater changes in treatment outcomes for adolescents (Chu & Kendall, 2009; Goense et al., 2016). As such, implementing OTMP interventions with high treatment integrity is critical given that brief, skills-based sessions may protect students against academic decrement over time (Evans et al., 2018).

Few studies have examined interventionist non-specific competence (hereafter referred to as, “competence”) over the course of school based OTMP intervention treatment periods and have typically measured the construct at a single timepoint or averaged across time using a mean score (Goense et al., 2018). Previous methods have not dis-aggregated competence session by session, which impedes understanding potential variability of competence over time. Specifically, no research has documented the invariance or stability of competence, or the potential change in competence across OTMP intervention sessions. Additionally, no studies have investigated possible factors associated with the pattern of competence over time. This gap in literature is especially crucial to address when developing school-based interventions for students with ADHD such that multiple factors may significantly impact the ways in which interventionists interact with students. Specific student factors that may be associated with the stability or variability in interventionist competence over time may vary at the start of the intervention and contribute to the unfolding pattern of competence and ultimately the student’s treatment outcomes. As such, it is important to examine the interventionists’ responsiveness and flexibility towards different students rising and falling. Specifically, certain students entering the intervention may require varying degrees of support. In all, this study examined both the ways in which interventionist competence unfolds over time and the factors that may contribute to this unfolding.

Research is also limited when exploring student engagement unfolding over time, as well as the extent to which engagement interacts with the possible pattern of interventionist competence. While student engagement is a stable predictor of greater

post-treatment improvement (Karver et al., 2006) the ways in which student engagement relates to interventionist competence is unclear. On one hand, interventionists may exhibit greater flexibility, or non-specific competence, in their responses to students who are disengaged and distracted by external stimuli. On the other hand, greater interventionist competence may be associated with highly engaged students who interact with the interventionist more and promote more animated and positive interventionist responses during sessions. As such, understanding the potential pattern of stability or change in student engagement over time and the ways in which engagement relates to competence may be important for interventionists to consider when working towards promoting the greatest student academic success.

Limited research has found that interventionist competence and student engagement exhibit a moderately positive correlation (r 's ranged .25-.41; Chu & Kendall, 2009). A single study to date has explored the variation in both competence and student engagement over time (Hudson et al., 2014), session-by-session. Findings indicated a concave quadric curve (inverted u-shape implying a rise and fall), with a single peak during the middle of CBT interventions for anxious youth, specifically when students reached a gradual exposure module of the treatment sessions. As such, it may be important to examine the specific components of the intervention timeline when analyzing the pattern of engagement and competence. No research has analyzed the potential trajectories of engagement and competence within the context of school based OTMP interventions for adolescents with ADHD, nor has research explored the

impact of student factors previously described on competence and engagement initially or over time.

Identifying patterns of variation or stability in competence over time will break new ground in treatment integrity research by informing when and how interventionists may adjust their level of responsiveness to students with ADHD during an intervention or when they may benefit from support or consultation to maintain high treatment integrity. Additionally, gaining a better understanding of the pattern of student engagement over time may help interventionists anticipate when students are expected to exhibit increases or decreases in their level of participation during school based OTMP interventions. In sum, unpacking possible trend(s) in competence and engagement while also determining specific predictors of competence and engagement may encourage researchers to identify baseline student characteristics that are anticipated to affect the students' progress during the intervention to varying degrees. Certain student characteristics (i.e., symptom severity, participation, co-occurring disorders, etc.) may result in greater likelihood of student success or as warning signs indicating that greater student support is needed within the OTMP intervention.

Research Aims and Corresponding Hypotheses

The study included two primary aims with sub-components as described in the following:

Research Aim 1: Model Competence and Engagement Separately

The first aim of the study was to examine patterns of interventionist competence and student engagement within the context of an OTMP intervention for

adolescent students with ADHD. The study first determined whether interventionist competence remains stable or varies over the course of intervention sessions by modeling the estimated mean (i.e., intercept) and potential variation (i.e., slope) of interventionist competence over time. Student engagement was also modeled separately using the same analyses to examine the stability or variation in the construct throughout the OTMP intervention. Once competence and engagement were modeled individually, the two constructs were compared to explore the extent to which the level of invariance or variability in competence aligns with or maps onto the potential pattern demonstrated in engagement both initially and over time.

Hypothesis 1A

It was hypothesized that significant change in the slope of interventionist competence will be observed, demonstrating that competence varies over the course of the school-based intervention.

Hypothesis 1B

It was expected that student engagement would exhibit change in the slope and exhibit significant variation over time.

Hypothesis 1C

Given the anticipated significant findings from *hypotheses 1A and 1B*, it was expected that the pattern of interventionist competence would interact with the pattern of student engagement over time such that the slopes and intercepts from both constructs would be significant. Specifically, interventionist responsiveness in their delivery of session content was expected to vary based on the extent to which student engagement varied over time.

Hypothesis 1D

When examining potential predictors of the growth parameters (intercept and slope) of competence, it was hypothesized that average student engagement (subsumed across all sessions) would significantly contribute to the pattern of stability or variance in interventionist competence. Likewise, when determining specific factors associated with the growth parameters of engagement, the study expected overall competence (mean across sessions) to be significantly associated with the pattern of stability or variance in engagement. However, this analysis was exploratory and no specific hypotheses were proposed regarding the direction of student engagement as associated with interventionist competence.

Research Aim 2: Explore Predictors Relating to Competence and Engagement

The second aim of the study was to explore the extent to which characteristics of students and interventionists are significantly associated with the means and possible variation (i.e., intercepts and slopes; growth parameters) in competence and engagement. Given findings from previous literature that suggested student characteristics may affect treatment outcomes, predictors that may influence the variance in both competence and engagement included the student's ADHD presentation type (Langberg et al., 2017; Gnanavel et al., 2019), baseline comorbid psychopathology such as externalizing or internalizing concerns (Jungbluth & Shirk, 2009; Lindsey et al., 2019), and baseline organizational skills (Evans et al., 2016). Given that several factors were examined as potential predictors explaining variance in either competence or engagement, multiple hypotheses were considered within this

aim to account for each student characteristic. Additionally, the constructs of competence and engagement were analyzed in two separate models.

Hypothesis 2A

It was expected that the estimated average and the potential variation in both interventionist competence and student engagement would be associated with greater ADHD symptom severity. It was assumed that students with ADHD combined presentation (both inattention and hyperactivity and impulsivity symptoms) may struggle with impulsive responses and become easily distracted (DuPaul & Langberg, 2014; Murphy et al., 2002), which hinders their abilities to keep intervention session goals in mind. These challenges may not be as apparent for students with ADHD who only struggle with inattention-related concerns. As such, it was expected that greater ADHD symptom severity would uniquely predict the stability and/or changes in competence and engagement.

Hypothesis 2B

It was hypothesized that baseline externalizing symptom severity would be associated with means and potential changes in competence and engagement. It was expected that greater externalizing behaviors (i.e., acting out against adults, yelling, refusing to comply with tasks), would be associated with more flexible responsiveness from interventionists that deviates from the protocol.

Hypothesis 2C

Baseline comorbid internalizing symptoms were expected to influence the pattern of student engagement, but not interventionist competence, such that students with internalizing concerns may exhibit behaviors such as withdrawal, which could

be interpreted by interventionists as a lack of involvement or participation with intervention materials. However, no specific hypotheses were proposed regarding the impact of internalizing behaviors on initial competence and potential change in competence. It is plausible for interventionists to either adjust their responsiveness and provide greater accommodations the student to encourage participation in the intervention or continue to deliver the intervention sessions without much flexibility or awareness of the student's internalizing concerns.

Hypothesis 2D

Baseline student organizational skills were expected to influence both patterns of competence and engagement. While no known study has used baseline organizational skills as a predictor of invariance or change in student engagement or interventionist competence, it is plausible for greater initial difficulties in organization of school materials and assignments to be associated with a greater need of support from interventionists. Additionally, disorganized students may have greater difficulties remaining engaged during the intervention, especially when the material challenges the student's present organizational capabilities.

Chapter 3: Methods

Design

This study used an archival data set of a school based OTMP intervention that was collected as part of a larger investigation of the Homework, Organization, and Planning Skills (HOPS) intervention (Langberg, Dvorsky, Molitor, Bouchtein, Eddy, Smith, Oddo, & Eadeh, 2017). The HOPS intervention is a brief, OTMP, skills-based treatment program designed to be implemented in schools and to teach students organization and time-management skills and how to apply skills they learn to effectively complete homework and prepare for tests. Student participants completed 16 HOPS sessions (approximately 20 minutes each) during their school day. Further descriptions and goals of HOPS intervention sessions are described in later sections.

Intervention procedures were administered by six school counselors (HOPS interventionists) who completed two, hour-long training sessions with the principal investigator, Dr. Joshua Langberg, prior to implementing the intervention. Once introduced to session materials and modules, interventionists did not receive any ongoing consultation or supervision during the HOPS intervention. Prior to sessions starting, parents and teachers completed baseline measures of youth ADHD symptomology, clinical psychopathology (i.e., internalizing and externalizing disorders), and organizational skills. The 16 HOPS sessions were typically completed within 11 weeks, with the first 10 sessions occurring twice weekly and the final six sessions occurring once per week. Interventionists administered HOPS sessions which were audio-recorded and reviewed by two independent coders. Independent

coders completed checklists measuring adherence and competence, while interventionists reported student engagement at the end of each session.

Data Collection and Procedures

This study was approved by the Virginia Commonwealth University IRB, the local school boards, and was funded by the U.S. Department of Education, Institute for Education Sciences, National Center for Education Research (IES Grant #R305A130011). Data collection occurred from 2014 through 2017. Students were recruited through school counselors and psychologists who provided parents with recruitment flyers and identified students whom they felt were a good fit for the study. School counselors and psychologists contacted parents directly to ask for permission for study staff to connect them for screening and enrollment. Next, phone screening was conducted to confirm students' eligibility for the study. Upon completing the phone screen and receiving signed informed consent from parents, measures were sent to teachers to assess their students' current organizational skills, psychopathology, ADHD symptoms, and homework problems, while students and parents completed an in-person evaluation consisting of diagnostic interviewing, rating scales, and student cognitive and achievement testing to rule out exclusion criteria.

Identifying information such as consent forms and demographic information was separated from the data and were deidentified. All data had been collected on paper measures and was entered into a Microsoft Excel spreadsheet by undergraduate and graduate researchers. Researchers independently entered the data twice and

congruence checking was completed. Deidentified data was then transferred into SPSS Version 28 where variables were cleaned, labeled, and finalized.

Participants

This study included participants from the larger research sample who were randomized to and participated in the HOPS intervention. In total, 111 participants from the larger research sample were considered eligible for the study. Participants included 74 male and 37 female adolescents ($M_{years} = 12$, $SD_{years} = 1.05$, $range = 10-14$ years). Approximately 92% ($N = 103$) of participants received all 16 HOPS sessions, with the remaining eight students received 50-70% of HOPS sessions. Participants were recruited from seven public middle schools in a large district containing urban, rural, and suburban communities in the Southeastern USA, representing a variety of school contexts and family backgrounds. Six cohorts of students participated over three successive school years, where a new cohort was recruited and enrolled each semester (one Fall cohort and one Spring cohort for three years). The students yielded a fairly diverse sample (55% White, 27% Black, 13% multiracial, .9% Asian, 1% American Indian). Approximately 56.8% of the sample was reported to use medication for ADHD.

Participants were included in this dataset if they met full *DSM-IV-TR* diagnostic criteria for ADHD (i.e., minimum six symptoms within the inattention or hyperactivity/impulsivity domains, 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 (ChIPS; Weller et al., 2000) and teacher ratings on the

NICHQ Vanderbilt ADHD Rating Scale (minimum of 4 symptoms endorsed; Wolraich et al., 2003). Approximately 53.2% of students met criteria for Inattention presentation (ADHD-IA) and 46.8% met for Combined presentation which consists of *DSM* symptoms of both Inattention and Hyperactivity/Impulsivity (ADHD-C). Participants must have also met eligibility by demonstrating a full-scale IQ of at least 80 as measured by the Wechsler Intelligence Scale for children, fourth edition (WISC-IV; Wechsler, 2003) and must have completed academic achievement testing from selected subtests from the Wechsler Individual Achievement Test, Third Edition (WIAT-III; Wechsler, 2009). Students were excluded from the study if they met criteria for pervasive developmental disorder, bipolar disorder, or psychosis. Based on a parent reported rating scale of social emotional functioning (BASC-2; described below; Reynolds & Kamphaus, 2004) approximately 37.8% of participants met criteria for a comorbid externalizing disorder (i.e., ODD), and 37% met criteria for a comorbid internalizing disorder (i.e., anxiety disorder or depressive disorder).

In addition, six school-based interventionists (a seventh interventionist was introduced for one student at one of the seven schools) were recruited and included in the study and were compensated by the principal investigator of the original HOPS study. Interventionists were early-career school counselors who had all recently completed their school counseling master's degree programs. Interventionists were similar in age (*range* = 25-27 years), and all were Caucasian. Interventionists were provided with the HOPS intervention manual and were assigned an approximately equal number of students to complete HOPS sessions with during the school-day.

The Intervention

The HOPS intervention is a school-based program that was developed to be implemented through brief, 20-minute sessions by school psychologists and school counselors during the school day. The program has been structured to fit well within the response-to-intervention (RTI) framework such that it is considered a tier 3, targeted intervention approach where an individual's progress can be tracked over time (Langberg et al., 2020). The HOPS intervention has been implemented in many schools across the USA and specifically serves students with attention problems or with formal diagnoses of ADHD. In addition to school counselors serving as HOPS interventionists, teachers and parents are considered key components of HOPS. Parents and teachers are notified of their responsibilities before the intervention begins by orienting them to the intervention and to review the skills taught by interventionists that can be used at home or during class. Another important aspect of HOPS is utilizing a contingency management system (i.e., the HOPS reward system), where students can earn a set number of points for engaging in productive organization and planning behaviors (i.e., no loose paper in backpack; teacher initial in agenda = 1 point). The points that students earn over HOPS sessions can later be exchanged for rewards (i.e., earn a homework pass to turn in work one day later, game time during HOPS session).

The HOPS intervention is broken into five modules (organization, homework recording, planning, time management, and self-management) across 16 sessions. The first six sessions present students with behavior strategies focusing on organization of materials and homework recording accuracy. The first sessions introduce students to organizational procedures including a binder system where they will store their

materials. Organizational checklists are also completed by the HOPS interventionist with the student during each session. Students work on organizing their backpacks (i.e., clean out old papers), incorporate a binder system as a central location to store materials, review the organizational checklist, and work to keep all assignments in an organized homework folder within their binder. These organization checklists are then completed at every HOPS session with the student. In session three, the homework recording intervention is introduced which promotes students accurately recording assignments in a planner and providing points for accuracy and detail by either a) comparing to the classroom's online system (e.g., Schoology) or b) using a teacher initials system where students must have their teachers initial next to assignments successfully written in their agendas before returning to the next HOPS session. The HOPS reward system is also introduced during the first few sessions to change behavior patterns by making rewards more immediately available when a student engages in organization, homework, and planning behaviors. Students earn points which accumulate for different types of rewards from a rewards menu created collaboratively with the student.

Starting in session seven, students are introduced to time management skills and work on strategies such as breaking up studying for tests and tasks on projects into small, manageable pieces, and planning for the timely completion of each piece. The interventionist also teaches the student to use a system for planning an evening schedule that balances times after school including extracurricular and family activities with school responsibilities. A Time Management Checklist is used to reward these behaviors with points which are similarly exchanged for rewards from

the rewards menu. Review sessions are incorporated into the HOPS intervention for students to ensure mastery of their organization, homework recording, time management planning skills. Interventionists also troubleshoot any barriers students face to engaging in the skills and adjust their plans and checklists to meet individual needs if applicable.

Final sessions of the HOPS intervention (12 through 16) focus on self-management strategies to promote student independence and academic success by teaching students to self-monitor and maintain their systems. At this stage in the intervention, sessions also decrease to once per week. Students work with the interventionists to develop a self-management checklist (using criteria to the organizational and time management skills checklists) and create a plan to stay motivated and regularly check and complete the checklist. This plan is discussed and revised weekly with the interventionist until the conclusion of the HOPS sessions.

The HOPS program also consists of two, hour-long parent meetings, after sessions five and again after sessions 13 to first orient parents to the structure of the program and later to teach parents how to take over the HOPS checklist completion and reward responsibilities from the interventionist. By the end of the intervention, parents will have worked with the interventionist (the school counselor of their child's school) to establish a plan for using the reward system at home.

Measures

Treatment Integrity

A coding system to accurately capture interventionist treatment integrity was established in the larger research trial of HOPS that is comprised of both adherence

and competence. Of the 16 HOPS sessions that were all audio-recorded, seven sessions (session numbers 3,4,6,7,8,9, and 12) were reviewed by two independent coders (i.e., two advanced undergraduate research assistants and one clinical psychology graduate student). These seven sessions were selected for coding because the content consisted of new strategies being introduced weekly to students whereas sessions that were not coded primarily focus on reinforcing strategies from previous sessions, check-ins on progress on organization and planning behaviors using the checklists, and reviewing material covered in previous sessions. Prior to starting HOPS, fidelity coders met with the principal investigator to complete training and continued to meet weekly to practice coding until their reliability of the coding system exceeded .70 agreement across all codes. Operational definitions of coding criteria were written in objective terms (further described below) and as such, agreement was consistently above 90%. Descriptions of the coding systems are described below.

Interventionist Competence. Interventionist non-specific competence was measured through a coding system completed by two independent coders. Competence codes captured the instances of five general therapeutic skills across each session, which are based on those that have been used and operationalized in previous treatment integrity research (e.g., Blackburn et al., 2001; Breitenstein et al., 2010). Competence codes included Vocal Animation and Excitement, Vocal Relaxation, Empathy, Collaborative Relationship, and Positivity, Encouragement and Motivation. Coders provided ratings on a 7-point rating scale. Within the measure, significantly high correlations between the five codes have been reported (r 's = .64-

.83; Breaux et. al., 2021). The interclass correlation coefficient (ICC) for inter-rater reliability of competency was 0.73 (ICCs ranged from 0.70 to 0.78 across codes; Breaux et al., 2021).

Vocal Animation and Excitement. The Vocal Animation and Excitement code describes the interventionist's variety in their tempo, pitch, volume, and emotion when delivering HOPS session content. Interventionists receive higher ratings when they are heard on recordings to present as more animated and excited and receive lower ratings for a more monotone or inexpressive style when working with adolescent participants.

Vocal Relaxation. This code describes how tense or anxious the interventionist sounds throughout the session audio recording. Interventionists receive higher ratings when they seem calm and relaxed and are rated lower when they seem tense or anxious with a tone that was tight, shaky, or nervous.

Empathy. The Empathy code describes the extent to which the interventionist uses emotional reflection and responds in a supportive manner to statements made by students that could be negative in nature (i.e., how hard schoolwork is, feeling stressed, etc.). Higher ratings are provided when the interventionist responds to student concerns in an understanding and empathetic manner, whereas interventionists receive lower ratings when perceived as not responsive or dismissive to student's negative comments. This code also included a "Not Applicable" option when no negative self-statements were made by the student across the entirety of the session , however, no participants received this rating within the selected sessions.

Collaborative Relationship. This code describes the degree to which interventionists engage student through asking open-ended questions and eliciting the student's input. Coders provide higher ratings for interventionists who seek student input and student-generated ideas and provide lower ratings when interventionists direct the session with limited student input.

Positivity/Encouraging/Motivation. Higher ratings are provided for this code when interventionists demonstrate their ability to provide encouragement and positive remarks to the student throughout the session. For example, positive remarks consisted of instances where the interventionist told the student, "Awesome job" or, "I know you can do it." Lower scores were given in the absence of these remarks.

Interventionist Adherence. Adherence was measured by two trained independent coders who each completed a Fidelity Checklist. The checklist was created based on HOPS session content and includes dichotomous ("yes"/ "no") responses regarding whether the interventionist abided by the HOPS treatment manual. Checklists range from six to nine items per session depending on the specific goals of that session (e.g., Did the interventionist ask the student if there were any questions regarding homework recording? Did the interventionist review the Materials Organization Plan?). Additional interventionist adherence behaviors included tasks such as reviewing previously introduced skills, introducing new skills at the correct time point of the session, and eliciting questions from the student. Interventionist adherence was calculated as the proportion of items that were covered in each session and averaged across sessions. Prior studies with this sample reported

that the ICC for inter-rater reliability of interventionist adherence was 0.79 (Breaux et al., 2021).

Student Engagement

Student engagement was measured using a single item rating which was collected at the end of each HOPS session and reported by the HOPS interventionist. Interventionists rated how engaged each student was on a 7-point scale ranging from 1 (not engaged, monotone, blank affect) to 7 (high engaged, animated, enthusiastic). This single-item measure captured direct behavior ratings (i.e., “engagement” has been pre-specified and operationally defined) and has been established as a reliable, efficient, and repeatable method (Fabiano et al., 2017).

Student Baseline Predictor Variables

ADHD Symptoms. The severity of ADHD symptoms was reported by parent and teacher ratings of diagnostic criteria from the Vanderbilt ADHD Diagnostic Rating Scale (VADRS; Wolraich et al., 2003). The VADRS is a *DSM-IV*-based scale that includes all 18 ADHD symptoms. Parents and teachers rated how frequently each ADHD symptom occurs on a 4-point Likert scale ranging from 0 (*never*) to 3 (*very often*). Items are considered clinically significant if they received ratings of “often” or “very often.” Both parent and teacher ratings of the VADRS were taken into consideration separately in analyses and have acceptable factor structure, with high internal consistencies equal to or greater than Cronbach’s alphas of .90 in every case (Wolraich et al., 2003).

Internalizing and Externalizing Symptoms. The presence of internalizing and externalizing symptom severity was measured through baseline parent ratings on

the Behavior Assessment System for Children, second edition (BASC-2; Reynolds & Kamphaus, 2004). The BASC-2 is a multidimensional questionnaire that evaluates a wide range of problem behaviors, emotional difficulties, and personal adaptive strengths in children, adolescents, and young adults between the ages of two and 25 years old. Within the parent-report, items assess the frequency of behaviors on a Likert scale ranging from 0 (*never*) to 3 (*almost always*). Ratings are then calculated into standardized, age-normed T-scores (mean = 50; standard deviation = 10). T-scores that exceed 60 represent potentially meaningful clinical elevations. The study examined two baseline composite scores from the BASC-2: the Internalizing Problems composite (consisting of Anxiety, Depression, and Somatization subscales) and the Externalizing Problems composite (comprised of Hyperactivity, Aggression, and Conduct Problems subscales) as predictors. The BASC-2 has good convergent validity (Reynolds & Kamphaus, 2004) and high internal consistency within the present study (α 's ranged around .80 for both Internalizing Problems and Externalizing Problems composite scales).

Organizational Problems. Baseline student organizational skill problems were measured using the total score from the Children's Organizational Skills Scale (COSS; Abikoff & Gallagher 2008), which is a measure of organization, planning, and time management skill deficits reported by parents. The COSS consists of three subscales, Task Planning, Organized Actions, and Memory and Materials management, as well as a Total score that includes all the items. Test-retest reliability is high across the three COSS subscales (0.94—0.99; Abikoff & Gallagher, 2008). Additionally, the COSS has been validated for use within an ADHD population

(Molitor et al., 2017). Baseline total COSS scores had adequate internal consistency ($\alpha = 0.80$) in the presented sample.

Data Analytic Plan

Analyses Accounting for Missing Data

Preliminary analyses were conducted to examine the pattern and frequency of missingness, and to confirm whether the data was missing at random (MAR) or missing completely at random (MCAR; Little, 1988; Little & Rubin, 2002). Full-information maximum likelihood accommodated missing items. This process estimated a likelihood function for each participant based on items that were present so that all the available data was used. In other words, the overall likelihood generated was the product of the likelihoods specified for all completed items. The full-information maximum likelihood approach is considered best practice when using structural equation modeling (Schafer & Graham, 2002) and has been shown to produce less-biased parameter estimates. and standard errors under missing at random (MAR) and missing completely at random (MCAR; Lee & Shi, 2021).

Preliminary Analyses

Descriptive Analyses. Preliminary analyses for the study reported descriptive information regarding the sample for each measure. Preliminary descriptive analyses included tests for determining outliers, as well as bivariate correlational analyses of the relations among the composite and/or subscale scores of each measure. Given the design of this study and recruitment procedures of the student participants (i.e., eligibility criteria that students must meet full diagnostic criteria for ADHD), data were expected to be significantly negatively skewed such that participants as a whole

had elevated ADHD symptom severity, organizational/homework problems, and co-occurring externalizing/internalizing problems relative to the general population. However, the modeling procedures accounted for non-normal distribution within this sample. Intercorrelations and descriptive statistics are presented to demonstrate whether key demographic variables are related to any study variables.

Correlations between Measures. Bivariate correlational analyses were also used to determine the extent to which interventionist competence (i.e., mean competence across sessions) related to student characteristics. Average student engagement (i.e., mean engagement as reported by the interventionist across sessions) was analyzed in relation to average competence. Previous implementation research by Chu and Kendall (2009) has reported that, within the context of a CBT study, competence, as measured through a 17-item observation coding scale called the Therapist Flexibility Questionnaire-Revised, was moderately related to later student engagement (r 's = .36 – .41; as measured through a six-item observation coding scale, the Child Involvement Rating Scale; Chu & Kendall, 2004) but only when the student was highly engaged from the beginning of the intervention.

Overall, it was expected in the present study that the link between the average interventionist competence and average student engagement would be significant. Next, bivariate correlations were conducted to examine the relations between competence, engagement, and student factors including the following baseline student characteristics: parent and teacher-reported student ADHD symptom severity, internalizing and externalizing symptoms per the parent-reported BASC-2, and organizational problems per the parent-reported COSS.

Latent Growth Modeling

To address the study's primary aims, a series of freed loading latent growth models were conducted to evaluate the stability and/or change in interventionist competence and student engagement over time. Data was uploaded into MPlus Version 8 modeling software (Muthén & Muthén, 1998-2022) for analysis.

Hypotheses 1A and *1B* were addressed by analyzing competence and engagement through separate univariate latent growth models to establish the pattern of change in these constructs over the course of the intervention. Analyses examined the intercepts (estimated average) and slopes (change over time), otherwise known as growth parameters, over the course of individual HOPS intervention sessions to determine whether there was significant overall levels and variation (between clinicians/students) over time. Freed loading models imply that participants may exhibit linear change (significant intercept and slopes), non-linear change (intercept and freed-loading slope), or no significant change in slopes over time (significant intercept only). Freed loading models fix the first timepoint to 0 and the last time point is fixed to 1, with all intermediate timepoints freely estimated (McArdle, 2009). For the freed loading model capturing the pattern of competence over time, latent intercept and slope factors were specified at the third and 12th sessions, with all intermediate sessions (4,6,7,8, and 9) freely estimated to accommodate potential nonlinear change. Regarding engagement, latent intercept and slope factors were specified for the freed loading model by the first and 16th sessions.

For all growth models, competence and engagement were treated as continuous manifest variables using a robust full information maximum likelihood

estimator (MLR). Moreover, to control for nesting effects of students within school interventionists and schools, the maximum likelihood with robust standard errors and chi-square (MLR) was used, which produces corrected standard errors in the presence of non-independent data due to nested data structures (Diggle et al., 2002), such as students nested within school interventionists and schools. Moreover, the latent growth models incorporate observed repeated measures as indicators on one or more of the latent factors to describe the unobserved growth trajectories. Specifically, the model naturally expands to estimate higher levels of nesting (e.g., repeated measures nested within child, and child nested within assigned interventionist).

Chi-square difference tests, model fit statistics, and parameter estimates were used to determine the best fitting model for competence and engagement. All likelihood ratio tests that were used for model comparisons made appropriate adjustments given the estimators (Satorra & Bentler, 2001). Model fit was based on the likelihood ratio chi-square test, as well as the comparative fit index (CFI), the Tucker-Lewis Index (TLI), and the root mean square error of approximation (RMSEA), with values of CFI and TLI $> .90$ and RMSEA $< .06$ being indicative of good fit.

Following the two univariate growth models, *hypothesis 1C* was addressed by examining a multivariate growth model to examine the relations between the growth parameters of competence and engagement simultaneously. The multivariate growth model allowed for examining whether the overall levels (intercepts) and change (slopes) in one construct would be associated with the overall levels and change in the other over time. Significant growth parameters (means and variances of intercepts and

slopes) from the univariate models were retained in the multivariate growth model with both competence and engagement.

Building on the initial multivariate growth model with both competence and engagement, conditional modeling added student baseline characteristics including ADHD presentation type, internalizing and externalizing symptoms, and organization problems, as predictors (to address *hypotheses 1C*, as well as *hypotheses 2A* through *2D*). This allowed for testing whether student factors predicted individual differences in level and/or rates of change in competence and engagement. In other words, to determine the extent to which these variables predict overall (mean) levels and variation or stability in competence and engagement. In the case of significant mean levels and variance in the intercepts and/or slopes in the multivariate model, paths would be added to estimate the association between the four predictors to each of the significant model intercept and slope parameters from the multivariate model. In all, the study could have incorporated up to four model parameters (means and variances of the slopes and intercepts).

Chapter 4: Results

Descriptive Analyses

Descriptive statistics regarding measures used are found within Tables 1, 4, and 5. The descriptive statistics also include bivariate correlational analyses of the relations among the five competence codes within the coding system (see Table 1). As expected, bivariate correlations of the five competence codes exhibited high, positive, significant relations (r 's ranged from .632-.832), which aligns with previous research (Breaux et al., 2021). Each competence code was significantly and positively related to at least one additional code. Additionally, although somewhat limited in range as shown in Table 1, all codes were appropriately skewed and normally distributed (i.e., kurtosis between -2 and +2 cutoffs).

All data were normally distributed (all kurtosis values were between -2 and +2; and skewness at or below .5), with the exception of teacher-reported hyperactive/impulsive ADHD symptoms which was moderately positively skewed (skewness = .585) and parent ratings on the BASC-2 Externalizing Problems scale which was highly positively skewed (skewness = .965), indicating *fewer* externalizing concerns within this sample. Descriptive statistics and bivariate correlations regarding the sex of students and all predictor variables are reported in Tables 6 and 7 in the *Appendix*. Descriptive information found that female students, on average, were reported as slightly more engaged than males ($M_{females} = 6.376$, $M_{males} = 6.056$) and displayed greater mean internalizing problems per the BASC-2 than males ($M_{females} = 58.72$, $M_{males} = 53.95$), as well as greater organizational problems per the COSS ($M_{females} = 72.78$, $M_{males} = 64.31$).

Table 1*Mean, Standard Deviation (SD), and Correlations between Competence Codes*

Competence Code	1	2	3	4	5
1.Vocal Animation/ Excitement					
2.Vocal Relaxation	.636***				
3.Empathy	.763***	.764***			
4.Collaborative Relationship	.784***	.683***	.823***		
5.Positive/Encouraging/Motivation	.820***	.706***	.829***	.832***	
<i>Mean</i>	5.625	5.848	5.785	5.398	5.811
<i>SD</i>	.741	.722	.703	.743	.730
<i>Minimum</i>	4.000	3.714	3.667	3.333	4.000
<i>Maximum</i>	7.000	7.000	7.000	7.000	7.000
<i>Skewness</i>	.456	-.144	.225	.491	.194
<i>Kurtosis</i>	-.861	-.159	-.371	-.171	-.795

Note. * = $p < 0.05$, ** = $p < 0.01$, *** = $p < .001$

Preliminary Analyses

Bivariate Correlations Between Predictors

To explore the relations amongst predictor variables, bivariate correlational analyses were conducted which revealed multiple, moderately strong relationships. All correlations between predictors are located in Table 8 in the *Appendix*. To summarize, parent-reported internalizing problems exhibited significant, moderate, and positive correlations to parent-reported externalizing problems ($r = .300$, $p < .001$), parent-reported organizational problems ($r = .333$, $p < .001$), and parent-reported ADHD hyperactive/impulsive symptoms ($r = .331$, $p < .001$). A small-to-moderate, negative relationship was also discovered between parent-reported internalizing problems and teacher-reported ADHD hyperactive/impulsive symptoms

($r = -.225, p < .01$). As internalizing behavior concerns increased, teacher-reported hyperactive/impulsive symptoms decreased.

Parent-reported externalizing problems were strongly correlated to greater parent-reported ADHD hyperactive/impulsive symptoms ($r = .644, p < .001$), moderately correlated to organizational problems ($r = .373, p < .001$), and weakly, yet significantly correlated to teacher-reported ADHD hyperactive/impulsive symptoms. Teacher- and parent-reported hyperactive/impulsive scales were moderately correlated with each other ($r = .315, p < .001$). Organizational problems and parent-reported ADHD hyperactive/impulsive symptoms exhibited a moderately positive relationship ($r = .349, p < .001$).

Bivariate Correlations Within and Between Competence and Engagement

Upon reviewing the content and activities across all sessions where competence coding took place, it was determined that four sessions, 4, 6, 9, and 12, contained the most content-related, skills training, and interventionist-student discussion. Hence, these analyses to determine relations between student engagement and interventionist competence were limited to these four sessions. To preliminarily examine how stable clinician competence and student engagement were across time, bivariate correlations of each construct were examined across time (see Table 2). Bivariate correlations within clinician competence demonstrated that competence ratings remained highly stable from session 4 to session 12 ($r's = .779 - .869$). Similarly, student engagement was moderately to highly stable from session 4 to session 12 with little variation ($r's = .473 - .753$).

To preliminarily examine the association *between* engagement and competence within each intervention session, bivariate correlations were also examined and reported in Table 2. Contrary to previous literature (Chu & Kendall, 2009), interventionist competence and overall student engagement were not statistically significantly correlated during any of the four selected coded sessions ($r_s = -.093$ to $.088$).

Table 2

Bivariate Correlations, Means, and Standard Deviations Between Clinician Competence and Student Engagement

	1	2	3	4	5	6	7	8
1. Competence Session 4	--							
2. Competence Session 6	.869	--						
3. Competence Session 9	.811	.809	--					
4. Competence Session 12	.779	.806	.805	--				
5. Student Engagement Session 4	-.093	-.038	-.060	-.096	--			
6. Student Engagement Session 6	.056	.088	.136	.117	.753	--		
7. Student Engagement Session 9	-.004	-.034	-.008	-.027	.655	.638	--	
8. Student Engagement Session 12	-.094	-.090	-.085	.017	.449	.669	.473	--
Means	5.688	5.727	5.682	5.655	6.169	6.217	6.183	6.133
Standard Deviations	.443	.518	.466	.516	1.056	1.270	1.016	1.916

Note. * = $p < 0.05$, ** = $p < 0.01$, *** = $p < .001$

Univariate Latent Growth Modeling

Unconditional latent growth modeling was used to examine the stability of interventionist competence and student engagement across the intervention, as well as to determine whether individual patterns of change occurred in engagement and competence. As such, two freed-loading univariate growth models were conducted to examine individual variance over time among growth parameters (e.g., intercept and slope) in competence and engagement. Preliminary univariate growth models were estimated to determine the best functional form of change (i.e., no change, linear change, nonlinear/freed-loading change). As shown in Table 9 in the *Appendix*, model

comparisons indicated that the nonlinear or freed-loading slope model, provided the best fit to both student engagement ($\Delta\chi^2 = 9.255$, $p = .010$) and interventionist competence ($\Delta\chi^2 = 5.349$, $p = .135$) based on global model fit statistics. As such, the freed-loading parameterization was used to represent both engagement and competence trajectories in the subsequent growth curve and conditional models described later in the results section. Each univariate model assumed a freed functional form of change with variation in intercepts and slopes across the course of the intervention.

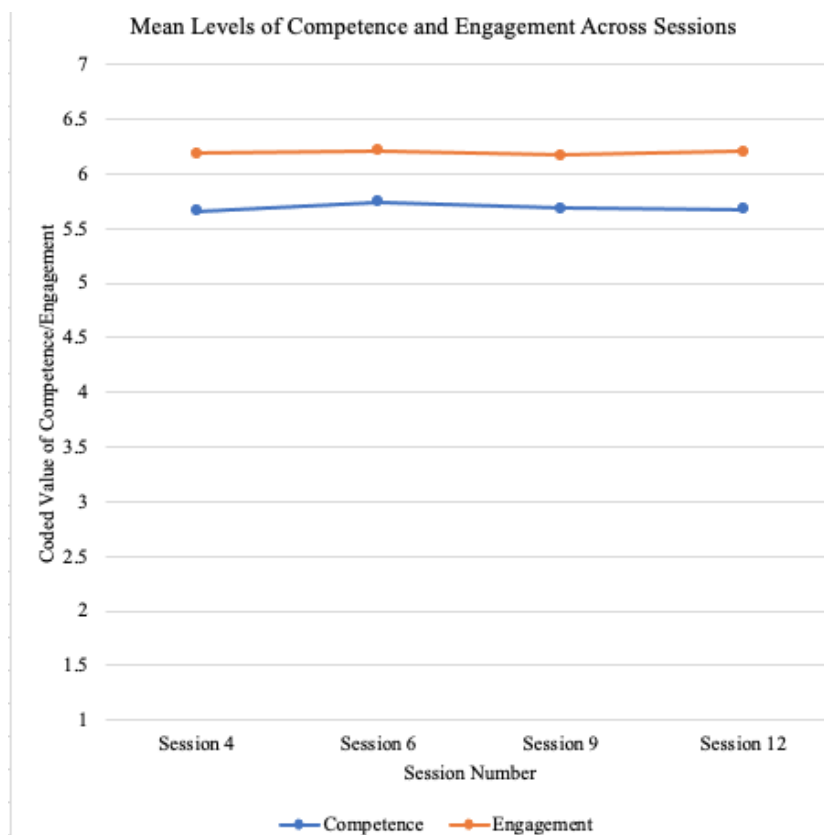
When examining the freed univariate latent growth model for interventionist competence, analyses revealed that the mean ($\mu = 5.663$, $p < .001$) and variance ($\phi = .365$, $p < .001$) of the intercept term were statistically significant, which indicates significant individual differences in initial levels of interventionist competence. The mean ($\mu = .012$, $p = .601$) and variance ($\phi = -.004$, $p = .725$) of the slope term were both nonsignificant, which indicated that all interventionist competence ratings were similarly stable over time. In other words, the change in interventionist competence was similarly minimal across coded sessions.

A freed univariate latent growth model was also conducted for student engagement, and found the mean ($\mu = 6.186$, $p < .001$) and variance ($\phi = .731$, $p < .001$) of the intercept were statistically significant, which indicated individual differences in initial levels of student engagement. However, the mean ($\mu = .018$, $p = .697$) and variance ($\phi = .084$, $p = .447$) of the slope for engagement was not significant. In other words, initial levels of student engagement individually varied, but all students showed minimal growth rate or change in engagement across

sessions. Plots of the model estimated growth trajectories of each construct are shown in Figure 1, which indicated no significant change (consistent slopes) and relatively high competence and engagement across sessions. Given that the lack of significant variation in the slopes for both interventionist competence and student engagement, research questions regarding predictors of change across competence and engagement were not testable. As such, the slope terms were set to zero in subsequent models.

Figure 1

Mean Trajectories of Competence and Engagement Across Sessions



Multivariate Latent Growth Model

Following the results from the two univariate growth models, an unconditional multivariate latent growth model was conducted to simultaneously assess the covariance and inter-individual variability in student engagement and

competence (intercepts). In other words, the analyses examined the relations between intercept growth parameters of engagement and competence together. The unconditional multivariate model found that initial levels (intercepts) of interventionist competence was not significantly associated with student engagement ($\phi = -.012, p = .935$).

Conditional Growth Modeling

Given the unconditional multivariate model determined that growth parameters for student engagement and competence were unrelated and for sake of model parsimony, conditional growth modeling was conducted univariately (examining student engagement and competence separately) to determine how baseline student characteristics predicted the growth parameters, specifically the intercepts, of interventionist competence and student engagement. Student characteristics including baseline internalizing and externalizing problems, baseline organizational skills problems, and parent- and teacher-reported baseline ADHD symptom severity (per Vanderbilt rating scales) were regressed on the intercept parameters for competence and engagement in two, separate models for each outcome. All predictors were included in each model simultaneously to determine what characteristics contributed to the variance in initial levels of competence or engagement.

Conditional Growth Model for Interventionist Competence

The conditional model fit the data well for competence, $\chi^2(26) = 413.795, p < .001, CFI = .975, TLI = .968, RMSEA = .065$ [90% CI: .000, .112]. The results of this analysis (reported in Table 3) revealed that of the student predictors, baseline

internalizing symptoms significantly contributed to the variance in initial levels of competence ($\beta = .224, p = .042$). As such, higher parent-reported higher internalizing symptoms were positively associated with interventionist competence. In addition, parent-reported ADHD hyperactive/impulsive symptoms were significantly negatively associated with competence ($\beta = -.313, p = .020$) such that greater hyperactivity/impulsivity severity predicted lower levels of interventionist competence. However, teacher-reported hyperactivity/impulsivity did not have an effect on initial levels of interventionist competence, nor did parent-reported externalizing problems or organizational problems. Together these predictors explained 7% of the variance in initial levels of competence ($R^2 = .073, p = .144$).

Conditional Growth Modeling of Engagement

A second conditional model examined how baseline student characteristics contributed to the initial levels of student engagement (see Table 3). The conditional model fit for engagement was adequate, $\chi^2(35) = 206.357, p < .001, CFI = .903, TLI = .883, RMSEA = .071$ [90% CI: .026, .109]. Findings revealed that none of the student characteristics significantly predicted engagement and together these characteristics predicted little variance in student engagement ($R^2 = .043, p = .401$).

Table 3

Conditional Multivariate Models with Student Characteristics Predicting Engagement and Competence

Predictors	Model Parameter (Intercept)	
	Student Engagement	Interventionist Competence
	Standardized β (SE)	Standardized β (SE)
Internalizing Problems	-.010 (.159)	.224* (.110)
Externalizing Problems	.022 (.171)	.056 (.129)
Organizational Problems	.010 (.159)	-.031(.111)
Parent Hyp/Imp Severity	.175 (.176)	-.323* (.135)
Teacher Hyp/Imp Severity	-.161 (.143)	.134 (.110)

Note. † $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Note. Hyp/Imp = hyperactivity/impulsivity symptom severity total score

Chapter 5: Discussion

This study examined the patterns of interventionist competence and student engagement over time/sessions during the course of an ADHD intervention, as well as student characteristics impacting these constructs as they were initially estimated and unfolded over time. Interventionist competence and student engagement have exhibited a positive relationship in previous research (Chu & Kendall, 2009; Karver et al., 2006). Moreover, higher degrees of interventionist competence (Collyer et al., 2020; Goense et al., 2016) and student engagement (Staudt, 2007) are each associated with positive intervention outcomes, including those of OTMP interventions (Breau et al., 2021; Harrison et al., 2019). As such, constructs were examined individually and were anticipated to demonstrate positive relations and significant patterns of change over time.

Both constructs demonstrated significant individual differences in initial levels, or estimated means. In other words, initial ratings of competence codes (completed by independent coders) varied, and interventionists reported significant differences in initial levels of student engagement during intervention sessions. However, inconsistent with the first set of hypotheses (i.e., hypotheses *1A*, *1B*, *1C*, and *1D*), trajectories of interventionist competence and student engagement did not significantly change over time (i.e., nonsignificant slope growth parameters), nor were they related to each other. Surprisingly, both constructs exhibited stable patterns with little variation throughout the intervention sessions. This finding may have resulted from the limited measures of both constructs (i.e., nonspecific aspects of competence and single item of engagement). It is also possible that brief, manualized

intervention sessions (i.e., 15-20 minutes in HOPS) did not capture the full potential range in development of students' engagement or the relational skills utilized by interventionists. Also contrary to the expected moderate relation between interventionist competence and student engagement (e.g., Chu & Kendall, 2009; Collyer et al., 2020; Hudson et al., 2014), no significant relationships emerged between these constructs within this sample. In other words, in the context of the HOPS study, the quality of interventionist's responses while delivering intervention sessions (competence) was distinct from the student's active participation (engagement).

Additional analyses were conducted to examine the extent to which specific student characteristics (i.e., ADHD hyperactivity/impulsivity, externalizing problems, internalizing problems, and organizational problems) were related to initial levels of competence and engagement. Predictor analyses revealed that greater parent-reported hyperactivity/impulsivity uniquely contributed to the variance in initial levels of interventionist competence. In addition, externalizing problems (which is comprised of hyperactivity, aggression, and conduct problem behaviors) was not significant, which supports that these unique findings are driven by the severity of hyperactive/impulsive symptoms impacting interventionist competence, not hyperactivity in combination with aggression and conduct problems.

The emergence of symptom severity as a unique predictor suggests that youth with ADHD-C presentation were more likely to be in sessions with lower observed interventionists' competence, which aligns with previous research supporting more severe ADHD symptoms negatively impacting interventionist's competence, or the

quality of the interventionist responses while working with students (Breaux et al., 2018b). Interventionists may struggle to focus on the nature of their responses which include positive, empathetic, or encouraging reactions. Instead, they may engage in different types of responses such as re-direction or repetition of instructions in session in an attempt to manage the disruptive behaviors and to ensure that intervention content is delivered exactly as outlined in the manual. Of note, this sample consisted of youth who were all diagnosed with ADHD and roughly half met criteria for ADHD-C presentation (i.e., participants who demonstrated elevated hyperactivity/impulsivity in addition to elevated inattentive symptoms).

In addition, the unique predictor of parent-reported ADHD symptom severity, not teacher-reported, may be in part due to informants observing students' behavior in different contexts. Findings revealed a positive, moderate correlation between parent and teacher-reported ADHD hyperactive/impulsive symptoms, which is consistent with the moderate to low agreement between raters in prior research (e.g., Yeguez & Sibley, 2016). The most robust correlational patterns from this study were within informants, specifically within the parent-reported ADHD inattentive and hyperactive/impulsive symptoms ($r = .519, p < .001$). It may be that parents have greater opportunities than teachers to observe their child's behavior in individualistic settings (e.g., supporting their child during homework time at home). Individualized settings are consistent with the HOPS intervention context (i.e., an individual intervention with a counselor at school). Moreover, teachers must manage whole-class instruction, or multiple classes if they are secondary teachers, and therefore may observe fewer behavioral challenges or compromise their familiarity with individual

student's behaviors. In addition, inattentive behaviors are often less disruptive than hyperactive/impulsive responses, which could result in teachers observing these types of behaviors less than parents.

The effect of baseline internalizing problems was also explored given that students with ADHD often have co-occurring conditions (Gillberg et al., 2004). Higher internalizing problems among students was associated with higher interventionist competence. More reserved students may elicit greater attention and support from interventionists, which can include words of encouragement and calming, reassuring tones as the students are more likely to withdrawal, isolate, or exhibit feelings of nervousness. Thus, interventionists may have had greater opportunities to use the types of relational skills coded in this study from audio recordings of each session as reflecting non-specific competence. Student characteristics may provide different opportunities for the interventionist to apply relational competence and the measure of competence may emphasize different aspects of interventionist competence.

In sum, certain student characteristics may elicit different interventionist responses and different measures may focus on different aspects of non-specific interventionist competence. Although student hyperactivity/impulsivity was associated with decreased competence, co-occurring internalizing symptoms in students was associated with interventionist responses that aligned with increased competence in this study (e.g., empathy, encouragement, relaxing tone). The reciprocal influences exerted between student behavior and interventionist competence in this study is consistent with developmental transactional models often

observed in parent-child psychopathology (e.g., Chronis-Tuscano et al., 2018; Ciciolla et al., 2014; Felton et al., 2021; Miller et al., 2018). Consistent with transactional processes observed in other child-adult relationships (e.g., child ADHD severity impacting parent's behavioral management; see Johnston & Chronis-Tuscano, 2015 for a review), this study found that interventionist competence was similarly impacted by student's severity of hyperactivity/impulsivity symptoms. Importantly, according to the transactional developmental framework, both the student's and interventionist's characteristics could reciprocally determine types of competence skills that the interventionist utilizes (Leve & Cicchetti, 2016). Although not observed in this study, these transactional processes, in theory, may eventually influence the ways in which the student receives and engages in the intervention.

Limitations and Future Directions

This study contributes to research focusing on the ways in which interventionists manage intervention implementation when working with students with ADHD, but there are multiple limitations that may be addressed by future studies. Perhaps one of the greatest limitations in this study are the methods with which competence and engagement were assessed. Specifically, ratings of session engagement were single-item reports completed by the interventionists and not by research coders (unlike competence) and therefore were subject to bias from the interventionists themselves in the rating. Given the single-item format, ratings of overall session engagement may not capture the multifaceted nature of the construct or the ways it may fluctuate throughout a session. Future research should consider implementing a more comprehensive measure of engagement that could be completed

by different coders and addresses multiple aspects of engagement that may change over time/sessions. For example, future studies may measure engagement by assessing between session behaviors (e.g., homework completion, skills practice) and in-session behaviors (e.g., the extent to which students asked questions, initiated comments during the session, or answered interventionist questions).

Regarding competence, the competence coding system used was developed based on prior, similar coding systems (e.g., Blackburn et al., 2001; Breitenstein et al., 2010) and the competence codes were operationalized by the developers of the HOPS intervention. To date, the coding system has not been standardized with other interventions, which also makes future replication challenging. In addition, competence, as viewed in this study, emphasized a non-specific, relational framework, that focuses on the nature of the interventionist's responses during the intervention (Aspelin et al., 2021; Podell et al., 2013). The competence coding system captured moments where interventionists effectively communicated and delivered intervention activities to the student through speaking in a positive tone or encouraging the student to participate. Yet, the codes did not explicitly capture the flexible responses to participant needs or behaviors that may particularly salient when working with students exhibiting low behavioral inhibition (e.g., re-direction, allowing for a break, providing choices). Hence, the measurement of the construct of competence in this study appeared to not fully envelop all of the components of non-specific competence that could have been captured. Comprehensive measures, such as the 17-item coding system covering eight areas of competence (i.e., The Therapist Flexibility Questionnaire-Revised: Frequency and Overall Rating Scale; Chu and

Kendall, 2009), should be considered in future research to gain a more in-depth view of interventionist competence. Results may differ based on the ways in which researchers conceptualize competence and how competence is defined when training interventionist and supporting their growth toward building competence (i.e., relating to implementation fidelity versus relating to quality of interactions). By implementing a more detailed or multidimensional measure of competence, additional aspects of non-specific competence may be more likely to be observed by coders.

Additional aspects of the original HOPS intervention structure pose as challenges when monitoring competence and engagement overtime through a therapeutic framework including session length and session content. Designed to be implemented in schools, HOPS intervention sessions were brief (average session time = 17.42 minutes, $SD = 3.5$ minutes; Langberg et al., 2017) and the overall duration of the intervention is short (i.e., 11 weeks), and while the brevity allowed sessions to be feasibly incorporated into the school day, less opportunity was present to capture potential changes in competence and engagement. Further, the content within the sessions was very structured and was meant to keep students active and continuously interacting with the interventionist in order to complete all activities within the 20-minute session window. It is plausible that the highly-structured sessions left little opportunity for more relational and flexible interventionist responses (i.e., empathy, positivity, re-direction, clarifying knowledge gaps, etc.) that would theoretically promote the development of greater engagement over time. Longer sessions (such as those described in clinic-based interventions including Abikoff et al., 2013; LaCount et al., 2018; Sibley et al., 2014) may reveal more variability in levels of engagement

and competence, especially when working with youth with ADHD who would be more likely to reach their threshold for attention and become more distractible during longer sessions.

Another component that may have impacted this study was the ethnic/racial identities of the interventionists and students. While the original HOPS study recruited a diverse sample of students, the seven interventionists were all Caucasian females. Previous literature has highlighted that interventionist-to-student ethnic/racial match can be an important predictor of treatment outcomes (Meyer & Zane, 2013). Future research should extend interventionist recruitment to diverse school mental health providers and consider the ethnic and racial demographics of the students with whom they anticipate working with and examine the relative role of these factors on the development of student engagement and interventionist competence over time. Moreover, the limited number of interventionists in this study ($N= 7$) posed as a separate limitation such that individual differences between interventionist characteristics could not be explored. Although the study accounted for nesting effects, analyses were not conducted from a nested framework, whereas studies with larger samples of interventionists across more schools and with more students could allow for exploring individual differences between interventionists as well as potential dyad analyses to explore potential interactive effects between interventionist characteristics (e.g., years of experience, prior training, credentials, intervention attitudes), competence and engagement.

Finally, future research may examine additional student characteristics such as medication status, grade point average (GPA), disciplinary referrals, and other

measures of academic impairment. Use of medication significantly reduces ADHD behavioral symptoms (i.e., hyperactivity and impulsivity; Pelham et al., 2022) which could, in theory, influence the degree students remained engaged during intervention sessions. Fewer hyperactivity/impulsivity symptoms managed by ADHD medication could also provide interventionists with greater opportunities to utilize therapeutic, flexible responses, which is particularly relevant given greater ADHD symptoms were associated with lower interventionist competence in this study. Other studies have also shown academic achievement (i.e., GPA) is negatively related to greater ADHD symptom severity (Smith & Langberg, 2018; Smith et al., 2020). It is possible that students with lower academic achievement may also affect ways in which interventionists respond to their needs throughout an intervention. For example, interventionists may provide more scaffolding and re-teaching of strategies to ensure understanding of procedures rather than exhibit relational skills such as empathy or positivity.

Conclusions and Implications

Despite these limitations, this study contributes to existing literature regarding school-based interventions for students with ADHD and specifically an understudied area of treatment integrity: interventionist competence (McLeod et al., 2018). While school-based interventions often focus on the implementation of procedures, research has highlighted that studies within schools are more likely to under-report treatment integrity methods generally and how interventionists are monitored during sessions (Sanetti et al., 2020). Moreover, few school-based research studies have explored *how* interventionists interact with students through authentic enthusiastic, empathetic,

collaborative, motivating, or calming responses over time, as well as how certain student characteristics may elicit different interventionist responses.

Findings indicated that both interventionists and students alike entered the intervention with varying degrees of engagement and competence. Differences in levels of competence were in part uniquely explained by greater hyperactivity/impulsivity. Additionally, baseline internalizing problems such as withdrawal and anxiety contributed to individual differences in interventionist competence (higher student internalizing associated with higher interventionist competence). This finding highlights the importance of interventionists taking advantage of opportunities during brief intervention sessions to incorporate relational, therapeutic responses into intervention implementation. Certain student behaviors and symptoms may elicit different relational and therapeutic responses (e.g., empathetic and supportive) from interventionists (e.g., student presenting with internalizing symptoms or hyperactivity/impulsivity behaviors). Future interventionists may benefit from training and ongoing consultation in specific evidence-based behavior management strategies to maintain quality intervention implementation with students presenting with different characteristics. Of note, the interventionists' training in HOPS did not emphasize therapeutic processes including the relational dynamics between the interventionist and student, nor did the original training discuss ways to implement in-session behavior management, further highlighting the need to enhance training depending on expertise of interventionists. Future training should prioritize guiding interventionists on how to effectively balance behavioral management with relational/therapeutic response styles (which are often affected by unique student

responses to the intervention) simultaneously to maintain an engagement-focused approach that motivates the students even in the context of frequent hyperactivity/impulsivity.

When considering the definition, measurement, and training of competence, future research will benefit from re-conceptualizing the construct such that competence may be better understood as the effectiveness in delivering treatment components through a relational and behavioral approach that takes into consideration initial or baseline student characteristics. Direct training on utilizing a combination of behavioral, relational, and motivational interaction styles (e.g., motivational interviewing; Sibley et al., 2016) is important to strengthen interventionists' abilities to seek opportunities to apply these skills in sessions, whether it is empathetic reactions or scaffolding a new activity. Moreover, training should emphasize supporting effective transactional processes between interventionists and students. Specifically, competence is a multifaceted construct and requires interventionists to use different strategies to balance interactions with various student presentations. For example, training materials could incorporate case scenarios and sample scripts with students with co-occurring anxiety or frequent hyperactive/impulsive behaviors in session, to illustrate the competent delivery of intervention components with a positive and motivational interaction style while also managing any disruptive behaviors effectively. More comprehensive training approaches that proactively prepare interventionists for the transactional processes between student and interventionist characteristics will further empower interventionists to have greater efficacy in their delivery, which could impact how students respond to them. Such an

approach would recognize the bi-directional influences that characterize session dynamics. Ultimately, future research will greatly benefit from re-conceptualizing competence as a delivery method of manualized intervention procedures that blends relational skills with responsiveness to students' learning, self-monitoring and self-regulation needs during an intervention.

Appendix A: Comprehensive Literature Review

ADHD Prevalence and Etiology

Researchers have reported a range of global prevalence rates of ADHD, with most studies suggesting 5-8% of children and adolescents receive this diagnosis, with a 10% prevalence rate in the United States alone. Prevalence rates can be affected by differences in diagnostic criteria across countries and research methods used.

Considering the heterogeneous presentation of ADHD symptoms, comprehending the underlying neurological and cognitive mechanisms of this disorder has been proven difficult (Gnanavel et al., 2019; Martella et al., 2020). While there is no single “cause” of ADHD, multiple causal mechanisms have been identified by researchers including neurological and genetic, hereditary, and environmental factors.

Additionally, a notable recent finding has established that ADHD is not diagnosed strictly due to social factors including but not limited to parent-child interactions, marital status, attachment styles, or peer interactions (Barkley, 2014).

Heredity is one of the most established causal factors of ADHD symptoms and is believed to play the largest role in ADHD symptoms in children. Over half of the children diagnosed with ADHD have parents who also have ADHD and 10%-35% of immediate family members are likely to also be diagnosed (Barkley, 2014). Additional research estimates that children with parents who have ADHD diagnoses are two to four times more likely to receive a diagnosis themselves (Nigg, 2016). Twin studies have also found that heritability estimates explain more than 75% of variation in ADHD symptoms, which is greater than schizophrenia and autism spectrum disorder (ASD; Barkley, 2014; DuPaul & Stoner, 2014). However, only 9-

20% of the variance in ADHD symptoms was explained by non-shared environmental factors per twin meta-analysis findings (Nikolas & Burt, 2010).

Neurobiological explanations for ADHD symptoms have also been extensively researched and have found that symptoms of ADHD may relate to abnormalities within the frontal lobe and prefrontal cortex. These irregularities are believed to contribute to heterogeneous neuropsychological profiles of ADHD such as different degrees of difficulty with inhibitory control and self-regulatory capabilities (Drechsler et al., 2020; Roberts et al., 2014). Neuropsychological differences are often mediated by prefrontal cortex pathways and may also reflect challenges with executive functioning, or cognitive processes such as executive attention and, “verbal working memory, temporal- sequential working memory, motor coordination, fine-motor movements, emotional and motivational self-regulation, verbal fluency, and planning” (Barkley, 2014 p. 379)

In addition, neurotransmitters such as dopamine and norepinephrine have been linked to ADHD symptoms such that significant differences have been reported in the dopamine transmitter gene (DAT1) and the dopamine receptor gene (DRD4) between ADHD and non-ADHD samples. However, it is important to note that researchers have suggested that genetic causal mechanisms may interact with environmental determinants which can increase or decrease the likelihood of the disorder (Nigg, 2005). Environmental factors including lead poisoning, prenatal exposure to toxins, and nutritional factors appear to affect the severity of ADHD symptoms presented but are less significant than hereditary and neurobiological causal mechanisms of ADHD. Environmental toxins, when compiled together, account for approximately 35% of

ADHD symptomology (DuPaul & Stoner, 2014). Specifically, Barkley (2014) reports that the etiological factor of maternal smoking explained about 11% of the variance in later ADHD symptoms of children.

In sum, multiple neurobiological factors contribute to approximately 65% of ADHD symptoms with a significant emphasis on hereditary influence. Given the complexity of these neurological pathways, extensive empirical work has been conducted to support the idea that ADHD symptoms are related to difficulties with frontal lobe impairment and executive functions (Barkley, 2014; Willcutt, 2014). Additionally, causal mechanisms can be moderated by early exposure to environmental toxins (Owens et al., 2014).

Presentations of ADHD

With the publication of the *Diagnostic and Statistical Manual of Mental Disorders, fifth edition* (DSM-V) in 2013, practitioners have updated the original nomenclature of ADHD “subtypes” to ADHD “presentations.” Research has described the former differentiation between ADHD subtypes as unstable and significantly affected by diagnostic setting, informant ratings, and age (Drechsler et al., 2020). Additionally, referring to “types” of ADHD implies more stable, trait-like characteristics, whereas “presentations” acknowledge that symptoms can *present* or appear differently over the course of an individual’s life (American Psychiatric Association, 2013). Currently, the DSM-V distinguishes three presentations in which at least six symptoms must be present to meet criteria: predominantly inattentive presentation, predominantly hyperactive/impulsive presentation, and combined

presentation (both inattention and hyperactive/impulsive criteria fulfilled; American Psychiatric Association, 2013).

Minimal research has reported specific differences among ADHD presentations in terms of developmental trajectory, co-occurring problems, and treatment response. Of the limited literature, one metaanalysis of 79 twin and adoption studies demonstrated small, yet significant, differences in the types of genetic and environmental factors influencing both ADHD inattention presentation and ADHD hyperactive/impulsive presentation symptoms (Nikolas & Burt, 2010). Specifically, additive genetic influences (i.e., total effect of genetic influences across multiple loci) on ADHD hyperactive/impulsive presentation were greater than those on ADHD inattention presentation, while dominant genetic effects (i.e., interactions among alleles within and between loci) on ADHD inattention presentation were larger than those effects on ADHD hyperactive/impulsive presentation. An additional study found that children with ADHD inattention presentation later exhibited greater academic skills deficits in adolescence in comparison with TD peers (d 's = 1.16-1.30), while children with ADHD combined presentation did not (Masseti et al., 2008).

While specific skills deficits and some genetic differences associated with ADHD presentation have been reported, significantly more research highlights the diagnostic instability of ADHD presentations over time. It is likely for students who meet criteria for one ADHD presentation to meet criteria for an additional or entirely different presentation later in their development (Roberts et al., 2014; Willcutt et al., 2012). Diagnostic instability may be a result from hyperactive and impulsive

symptoms emerging earlier in development than inattentive behaviors. Alternatively, children who previously exhibit hyperactive-impulsive behaviors may exhibit fewer symptoms at a lesser severity as they enter their adolescence (Barkley, 2014; Willcutt et al., 2012). As a result of this instability, interventions for youth with ADHD often do not differentiate between presentation groups unless specifically recruiting for a presentation.

Differences in Male and Female Youth with ADHD

Given past DSM field trials for ADHD mostly consisted of male participants, ADHD was thought to be only prevalent in males throughout much of the 1900's, resulting in significant underreporting of females with impairment that aligned with core symptoms of ADHD (Barkley, 2014). However, the prevalence and presentations of these symptoms may vary based on sex as well as the source of the sample (i.e., community versus clinical). The ratio of males to females with ADHD ranges considerably across studies, from 2:1 to 10:1, with findings from multiple studies reporting that male children, on average, are three times more likely be diagnosed with ADHD than girl children in community samples and are five to nine times more likely to receive an ADHD diagnosis than girls among children in clinical samples (Barkley, 2014; DuPaul & Stoner, 2014). However, one challenge researchers face when capturing differences between males and females with ADHD specifically is the suspected referral bias that takes place in clinical samples versus those within community samples. Specifically, individuals who are clinically referred often present with greater symptom severity, which are often hyperactive or impulsive symptoms rather than inattention and may contribute to the larger ratios

from males to females with ADHD (Owens et al., 2014). Referral bias from clinicians can create prevalence rates that are not representative of the nature of ADHD within its natural state.

In addition to the differences in ADHD prevalence ratings between boys and girls in clinical versus community samples, mixed findings have also been reported regarding differences in ADHD presentation based on sex. Some studies have found that girls diagnosed with ADHD are more likely to endorse fewer symptoms and receive diagnoses of ADHD inattention presentation type than boys, although ADHD combined presentation is the most prevalent diagnosis (within clinical samples, respectively; Biederman et al., 2002; MTA Cooperative Group, 1999). An additional recent meta-analysis of 54 articles comparing boys and girls with ADHD diagnoses reported that boys with ADHD exhibit significantly more hyperactive behaviors and experience greater difficulties with inhibitory control than girls with ADHD (Loyer Carbonneau et al., 2021). One study also reported significant differences regarding ADHD combined presentation such that boys received significantly more hyperactive–impulsive ratings than girls, but no differences in inattention symptoms based on sex were reported (Elkins et al., 2011).

However, other studies have reported no significant differences based on sex in ADHD presentation type within community samples. For example, Biederman et al. (2005) reported on 577 children with and without ADHD diagnoses and found no statistically significant differences in ADHD presentation type based on sex (58% females and 61% males received ADHD combined presentation diagnoses; 25% females and 27% males were diagnosed with ADHD inattention presentation

type). Another study by Mayfield and colleagues (2018) also found no main effect for child sex for parent-reported ADHD symptom severity. Despite these findings, it is important to note that females with ADHD have been considered an understudied population within the literature (Hinshaw et al., 2022), which may impact current prevalence ratings.

Comorbidities with ADHD

Review studies conducted by Drechsler et al. (2020) and Gnanavel et al. (2019) report a wide range of prevalence rates of co-occurring disorders from previous literature, with the most frequently reported comorbidities including ASD (59-85%), learning disorders (5-50%), Tourette's disorder (20-55%), anxiety disorders and depressive disorders (12-50%), conduct disorder (CD; 3-10%), and oppositional defiance disorder (ODD; 27-55%). The range in percentages is believed to be a result of differences in diagnostic strategies, informants reporting symptom severity (i.e., clinician-report versus parent or teacher-report), and discrimination between both ADHD and the co-occurring conditions in individual studies. Due to these factors, some researchers argue that findings from certain disorders cannot be reliably associated with receiving a diagnosis of ADHD. For example, studies exploring ADHD and bipolar disorder reveal dramatically different results across studies, which prevents researchers from determining whether an ADHD diagnosis is considered an antecedent for youth who later develop bipolar disorder (Gillberg et al., 2004; Gnanavel et al., 2019).

Additionally, comorbid disorders may be a result of symptom overlap between diagnoses such as difficulties with behavioral inhibition (i.e., remaining

seated, not blurting out answers) being associated with both ADHD combined presentation and ODD, as well as the association between working memory challenges and ADHD inattention presentation and internalizing disorders (Faraone et al., 2019; Molitor et al., 2019b). However, some research suggests that certain ADHD presentations are associated with a greater likelihood of receiving a comorbid disorder diagnosis. For example, a metaanalysis by Willcutt et al. (2012) reported that individuals with ADHD combined presentation were 10 to 15 times more likely than non-ADHD individuals to receive a diagnosis of ODD.

Additional conditions associated with ADHD include co-occurring challenges with enuresis (17%), sleep disorders (25-70%), and are at a statistically significantly greater risk of developing substance misuse disorders during adolescence and into adulthood compared to TD peers (Drechsler et al., 2020; Gillberg et al., 2004). Children with ADHD are one to three more times likely to misuse substances in adolescence or adulthood (Owens et al., 2014). The risk of suicidal behavior is significantly greater for adolescents with ADHD than their TD peers as well, especially for those with ADHD combined presentation diagnoses, and regardless of sex (Chronis-Tuscano et al., 2010). Finally, an estimated 50% to 80% of youth with ADHD struggle with managing social situations (Kofler et al., 2017) and an estimated 50% to 75% of youth with ADHD struggle with emotion regulation strategies such as managing their impulsive behavioral responses or frustration tolerance (Drechsler et al., 2020), which can lead to greater risk for mood disorders.

Generally, girls with ADHD may be at a higher risk of being diagnosed with a comorbid internalizing disorder than boys with ADHD, and boys may be at a higher

risk of externalizing challenges, substance misuse, and conduct behavior-related concerns (Loyer Carbonneau et al., 2021). However, it is important to note that these differences between sexes may not be specific to ADHD. For example, while some studies support that females with ADHD are at a greater risk of developing internalizing disorders, this risk factor is true for all females, not just those with ADHD (Owens et al., 2014).

Additional Theories of ADHD

Numerous theoretical models exist in ADHD research which address at least one of the following factors as a primary deficit of the disorder: motor coordination, cognitive functioning (specifically executive functioning), effort allocation, self-monitoring, internal locus of control, following instructions, self-regulation of emotion and motivation, and time management (Willcutt, 2014). Specifically, many adolescents with ADHD struggle with neuropsychological weaknesses driven by suspected prefrontal cortex deficits (Sonuga-Barke, 2005). These weaknesses may explain behavioral concerns such as lack of inhibitory control. However, alternative models have emerged which suggest that ADHD symptoms originate from difficulties with delayed motivational processes (Smith & Langberg, 2020).

Cognitive Dysfunction Models

Some of the most cited theories of ADHD posit that symptoms are attributable weaknesses in executive functioning skills (EF), or cognitive processes involved in one's abilities to inhibit dominant responses, organize or plan for future tasks, modulate emotional and behavioral reactions, and alter perceptions of a situation (Miyake et al., 2000; Molitor et al., 2019a). Researchers have divided EF skills into

top-down, higher-order processes including executive attention, working memory, planning, organizing, and cognitive reappraisal, as well as bottom-up EF skills such as inhibition and automatic processes controlling emotional, behavioral, and physiological stress responses to social situations (Nigg, 2016). Cognitive dysfunction theories highlight deficits in both specific higher-order and bottom-up abilities. For example, Barkley's seminal unified theory of ADHD (1997) poses that individuals with ADHD struggle with brain-behavior relations due to poor inhibitory control, or the EF skill responsible for volitionally responding with or resisting a dominant response to a situation (Tiego et al., 2019). Metanalyses have confirmed that ADHD and EF skill deficits exhibit medium to large effect sizes and that poor inhibitory control specifically explains about 10% of the variance in ADHD symptoms (Barkley, 2014; Willcutt et al., 2005).

However, later cognitive dysfunction models such as the EF extended phenotype model, also posited by Barkley (2014), suggests that ADHD symptoms are not solely due to inhibitory control deficits. Rather, Barkley (2014) proposes that the interaction between EF skills and self-regulation ultimately drive the individual's behaviors. Previous studies have found that EF skills and self-regulation are related such that cognitive processes such as executive attention and inhibition assist in the modulation of emotional and behavioral responses. As such, findings suggest that self-regulation consists of bi-directional relations within an individual in terms of thoughts, feelings, and behaviors (Raver et al., 2012).

Cognitive dysfunction or deficits in EF skills has also been linked lower overall academic achievement in students with ADHD (Biederman et al., 2004;

Kofler et al., 2008). For example, EF skills deficits may manifest as multiple educational challenges such that students with ADHD may be more likely to misplace assignments and materials, impulsively call out in class, struggle to follow directions with multiple steps, and fail to plan for upcoming homework and projects more often than their TD classmates (DuPaul & Langberg, 2014; Molitor et al., 2019a).

However, research has indicated a range of prevalence rates for EF deficits among samples of youth with ADHD (Barkley, 2014), suggesting that while EF impairment is still a key feature of ADHD symptoms, specific EF skills impairment may vary across individuals with ADHD.

Motivational Dysfunction Theory

The motivation deficit theoretical orientation of ADHD proposes that symptoms are due to delayed signaling in both motivational and reward processes. Motivation refers to internally driven mechanisms that encourage individuals to respond to situations through goal-directed behaviors (Smith & Langberg, 2018). Motivation differs from reward sensitivity such that reward processes are often externally motivated (i.e., through punishment or tangible rewards) whereas motivational processes are more intrinsic. Similar to cognitive dysfunction models, motivation dysfunction models highlight neurological impairments in the prefrontal cortex, amygdala, and limbic structures which are believed to be responsible for reward signaling and regulating motivational states (Songua-Barke, 2005; Willcutt, 2014).

In addition, poor motivational processes often impact motivation specifically in academic settings. Studies have reported that students with ADHD are more likely

to lack the intrinsic drive to engage in goal-directed behaviors and to complete tasks than their TD peers. Poor academic motivation can lead to students with ADHD having poorer homework performance, lower reading accuracy, and declining GPA's (Smith & Langberg, 2018; Smith et al., 2020). Additionally, students with ADHD often struggle with abnormal reward processes, resulting in behavioral responses such as seeking immediate gratification, poor impulse control (i.e., calling out) and lack of responsiveness to both positive and negative consequences for their actions (i.e., being scolded for cutting in the lunch line but can get lunch quicker). Repeated failures by students with ADHD to plan for and meet appropriate deadlines results in greater challenges to initiate and maintain academic motivation for future assignments (Smith et al., 2020). However, it is important to note that research suggests that motivational dysfunction should not be considered as the singular causal mechanism of ADHD in children and adolescents but rather a factor that amplifies the academic deficits associated with students with ADHD (Willcutt, 2014).

Appendix B: Tables

Table 4

Mean, Standard Deviation, and Correlations between BASC-2 Composite Scales

BASC-2 Composite Score	1	2
1.Internalizing Problems		
2.Externalizing Problems	.300**	
<i>Mean</i>	55.50	59.60
<i>SD</i>	12.725	12.121
<i>Minimum</i>	33	40
<i>Maximum</i>	93	99
<i>Skewness</i>	.528	.965
<i>Kurtosis</i>	.271	.821

Note. * = $p < 0.05$, ** = $p < 0.01$

Table 5

Mean, Standard Deviation, and Correlations between Vanderbilt ADHD Scales

Vanderbilt ADHD Scale	1	2	3	4
1.Parent Inattention				
2.Teacher Inattention	.048			
3.Parent Hyperactive/Impulsive	.519**	.115		
4.Teacher Hyperactive/Impulsive	.010	.503**	.315**	
<i>Mean</i>	20.161	16.283	11.250	8.201
<i>SD</i>	5.253	5.772	7.056	6.478
<i>Minimum</i>	3.000	1.000	0.000	0.000
<i>Maximum</i>	27.000	27.000	27.000	27.000
<i>Skewness</i>	-.689	-.291	.255	.585
<i>Kurtosis</i>	.146	-.696	-.750	-.448

Note. * = $p < 0.05$, ** = $p < 0.01$

Table 6*Correlational Analyses between Student Sex and Predictors*

Measure/ Predictor	1
1. Student Sex	--
2. Internalizing Problems	.176
3. Externalizing Problems	.064
4. Organizational Problems	.410**
5. Parent ADHD hyp/imp	.059
6. Teacher ADHD hyp/imp	-.155

Note. † = $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 7*Demographics and Mean Scores by Student Sex*

Variable	Male (N = 74)	Female (N=37)
Mean Age (SD)	12.09 (.975)	11.79 (1.166)
Race/Ethnicity	.	
White	57%	50%
Black/African American	28%	34%
More than one race/ethnicity	10%	15%
Asian	1%	--
American Indian/Native American	2%	--
Mean Competence (SD)	5.67 (.635)	5.72 (.707)
Mean Engagement (SD)	6.05 (.919)	6.37 (.619)
Mean Organizational Problems (SD)	64.31 (7.542)	72.78 (11.297)
Mean Internalizing Problems (SD)	53.95 (12.676)	58.72 (12.383)
Mean Externalizing Problems (SD)	59.07 (12.137)	60.72 (12.181)
Mean Parent ADHD hyp/imp (SD)	10.96 (7.340)	11.84 (6.510)
Mean Teacher ADHD hyp/imp (SD)	8.92 (6.565)	6.80 (6.140)

Table 8*Correlational Analyses between Predictors*

Measure/ Predictor	1	2	3	4	5
1. Internalizing Problems	--				
2. Externalizing Problems	.300***	--			
3. Organizational Problems	.333***	.373***	--		
4. Parent ADHD hyp/imp	.331***	.644***	.349***	--	
5. Teacher ADHD hyp/imp	-.225**	.180*	-.125	.315**	--

Note. † = $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Note. *Hyp/imp* = hyperactive/impulsive symptoms subscale from the Vanderbilt ADHD rating scale

Table 9*Unconditional Univariate Latent Growth Models for Competence and Engagement*

Model	Model Fit Indices					
	χ^2	<i>df</i>	$\Delta\chi^2$	CFI	TLI	RMSEA
Competence						
Intercept only	13.372	8	--	.986	.989	.079
Intercept + linear slope	7.804	5	5.568	.993	.991	.072
Intercept + freed loading slope	1.735	3	5.349†	1.000	1.000	.000
Engagement						
Intercept only	13.981	8	--	.950	.963	.112
Intercept + linear slope	7.804	5	1.966	.993	.991	.072
Intercept + freed loading slope	2.76	3	9.255*	1.000	1.000	.000

Note. † $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$. CFI = comparative model fit; TLI = Tucker-Lewis Index; RMSEA = root mean square error of approximation.

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