UNIVERSITY OF CALIFORNIA
RIVERSIDE

Teachers as a Viable Mechanism of Change to Support Students' Self-Regulation

A Dissertation submitted in partial satisfaction
of the requirements for the degree of

Doctor of Philosophy

in

Education

by

Elissa M. Monteiro

September 2024

Dissertation Committee:
Dr. Stephanie Moore, Committee Chairperson
Dr. Eui Kyung Kim
Dr. Austin Johnson

The Dissertation of Elissa M. Monteiro is approved:

_____

_____

_____

Committee Chairperson

University of California, Riverside

Acknowledgements

I would like to express my appreciation for several people without whom I would not have been able to complete this dissertation and my doctoral degree. Thank you to my advisor, Dr. Stephanie Moore, for providing support and guidance throughout this dissertation process and during the past years. Your encouragement means so much to me. Thank you to my fellow co-authors, Melissa Klaib, MA and Dr. Ashley Donham. Thank you to the pre-service teachers who participated in the study. My biggest thanks to my family for all the support you have provided me throughout the past five years and to my cats for good company whilst writing. Last but certainly not least, thank you to my husband Josh. You are my favorite person and my biggest fan.

Dedication

This dissertation is dedicated to the several students whose struggles inspired this work and the teachers who work diligently each day to support all students

ABSTRACT OF THE DISSERTATION

Teachers as a Viable Mechanism of Change to Support Students' Self-Regulation

by

Elissa M. Monteiro

Doctor of Philosophy, Graduate Program in Education
University of California, Riverside, September 2024
Dr. Stephanie Moore, Chairperson

Self-regulation is a multidimensional set of skills critical for providing students the foundation for goal-based, self-controlled behavior. These skills are a predictor of students' academic success and behavioral, social, and emotional well-being. A wealth of research has been dedicated to implementation of evidence-based interventions targeting students' self-regulation, particularly for students with attention deficit hyperactivity disorder (ADHD) whom teachers often report are more stressful to teach. Lack of knowledge about ADHD, low self-efficacy in supporting students with ADHD, and negative student-teacher relationships have been found to contribute to teacher stress. However, there remains a need to address whether teacher factors (e.g., knowledge about ADHD, experience working with students with ADHD) influence the effectiveness of interventions targeting ADHD symptoms. This dissertation is composed of two studies that aimed to examine the teacher-level factors salient for improving school-based interventions designed for students with ADHD. The first study used a small scale, in-depth systematic literature review to investigate intervention studies that concurrently

measured student outcomes and teacher-level factors to elucidate teacher-level barriers and facilitators of each of the interventions. The second study evaluated the effectiveness of a teacher training designed to improve pre-service teacher knowledge about ADHD and self-efficacy in their ability to support students with ADHD. Recommendations are made for future directions in school-based ADHD intervention research and implications are discussed for educators and school psychological practice.

Table of Contents

List of Tables

List of Figures

I. Introduction

Self-regulation is unparalleled in importance to children's mental health and their success in school (Graziano et al., 2007; Nigg, 2017; Röthlisberger et al., 2013; Sawyer et al., 2021). It has been identified as an asset for school readiness and a strong predictor of future academic achievement (Blair, 2016; Mazzocco & Kover, 2007). Self-regulatory capabilities also inform social and intellectual developmental milestones and are a leading predictor of occupational success and physical health (Aadland et al., 2018; Tangney et al., 2004; Woodward et al., 2017).

Although self-regulation is widely understood as a multidimensional construct critical for students' learning, emotional well-being, and social skills (Tangney et al., 2004), there is a longstanding debate about the definition of self-regulation and its specific components (Kochanska et al., 2001). In this study, self-regulation is defined as the ability (a) to hold information in mind in order to mentally manipulate that information and to act on the basis of it, (b) to act on the basis of choice rather than impulse by resisting inappropriate behaviors and (c) to quickly and flexibly adapt behavior to changing situations to meet goals (Davidson et al., 2006). In the context of development, successful self-regulatory skills are those behaviors that promote self-soothing in infants, shape children's appropriate learning behaviors in school, and foster rule-following in adults (Blair et al., 2010). Individual development can be understood as an increasing capacity for self-regulation, where a child's ability to function independently in an environment progresses with age (Best & Miller, 2010).

Self-Regulation is Facilitated by Executive Functioning

Executive functions are the cognitive processes that guide the behavioral mechanisms of self-regulation as an individual develops (Nigg, 2017). Executive functions are recruited to control attention and harness inhibition, which can be operationalized as rule following and behavioral control in a classroom setting (Anderson, 2002a; Davidson et al., 2006; Pagani et al., 2012; Zelazo, 2003). Historically difficult to decompose, much debate still exists regarding models of self-regulation and executive functioning (Lin et al., 2019; McCoy, 2019; Salimpoor & Desrocher, 2006). Nigg (2017) proposes that self-regulation capabilities are composed of top-down and bottom-up components that influence one another, including regulation of action, emotion, and cognition (Nigg, 2017). Self-regulation draws upon numerous aspects of cognition, including four distinct executive function capacities: attentional control, information processing, cognitive flexibility, and goal setting. Each domain involves highly integrated cognitive processes, and each receives and processes stimuli from multiple sources (Anderson, 2002a). Executive function skills—which include inhibition, set shifting, cognitive flexibility, organization, planning, self-monitoring, working memory, following rules, and emotional regulation—enable an individual to control their physical, cognitive, and emotional self (Akbar et al., 2013; Davidson et al., 2006; Pennington & Ozonoff, 1996).

Within the confines of daily life, executive function skills allow individuals to break out of habits, make decisions and evaluate risks, plan for the future, prioritize and sequence actions, and cope with novel situations (Bridgett et al., 2013; Langberg et al.,

2011a; Nigg, 2017). These “ecologically valid” executive function skills are important for understanding how a child operates in their naturalized settings such as at home (e.g., working memory), at school (e.g., task switching), and with peers (e.g., inhibition). Ecologically valid executive function skills are observable behaviors that have extrinsic effects on others and the environment, and are especially important for learning and success in school (Monteiro, 2021; Nigg, 2017). Consequently, school-based service providers have ramped up efforts to design interventions that support students’ executive function skills via tiered systems of support (DiPiazza & Palmer, 2023). Webb and colleagues’ (2018) model of self-regulation and executive function skills identifies six *school-based* executive function skills:

1. Metacognition: Thinking about thinking, keeping track of progress towards a goal, recognizing the need for a strategy, evaluating the effectiveness of a strategy used
2. Planning/organizing: Goal setting and preparing, designing steps to accomplish a goal, managing time, keeping belongings organized, organization of information
3. Initiating: Starting a task, engaging in a behavior to achieve a goal, beginning a thought process, interacting with others to start or maintain social relationships
4. Sustaining: Maintaining focus, efforts, or attention, resisting distraction
5. Inhibiting: Controlling impulsive and/or negative behaviors, suppressing thoughts to prevent interrupting or blurting out answers
6. Flexibility: Thinking about things from various perspectives, being open to new ways of doing things or solving problems, shifting easily from one activity to another, adapting to change

This dissertation will use "self-regulation" to refer to the set of executive function skills that are essential for students' learning and success in school.

Cascading Effects of Self-Regulation Across the Lifespan

Self-regulation involves developing an awareness of social demands and expectations, tolerating environmental changes, and learning to modulate emotions and behaviors in response to situational demands (Woodward et al., 2017). Students with developmentally appropriate self-regulation skills are more likely to experience a range of positive outcomes including higher sociability, fewer externalizing behavior problems, and better performance in school (Clark et al., 2010; Eisenberg et al., 2010; McClelland & Cameron, 2011). In contrast, deficits in these processes predict a developmental cascade of risk for mental health difficulties, children's success in school, and important life outcomes including academic and occupational success (Ansari, 2017; Berdan et al., 2008; Moffitt et al., 2011). Poor self-regulation skills co-occur with symptoms of neurodevelopmental and learning disorders (e.g., attention deficit hyperactivity disorder, autism, specific learning disability) and a range of internalizing (e.g., depression, bipolar disorder) and externalizing psychopathologies (e.g., oppositional defiant disorder; Eisenberg, 2017; Otterman et al., 2019; Wakschlag et al., 2012). Among neurotypical children, poor self-regulation has been linked to increased aggression and antisocial behaviors (Kochanska et al., 2000); this trend often persists into adolescence where poor self-regulation has been linked with aggressive and delinquent behavior, especially in boys (Krueger et al., 1996). Relatedly, delay of gratification and impulse control, both of

which are important aspects of an individual's ability to regulate their behavior in the classroom, are closely associated with self-regulation (Block et al., 2002).

To illustrate the cascade of outcomes associated with poor self-regulation skills, Moffit and colleagues (2011) followed a cohort of 1,000 children from birth to age 32 to explore the utility of self-regulation in predicting outcomes across several facets of life including mental and physical health, wealth, and criminality. In this study, researchers successfully disentangled individuals' self-regulation skills from intelligence, social class, and externalizing behaviors to extract self-regulation as a reliable predictor for later life outcomes. Results suggested that, even after controlling for intelligence and social class, chilren's self-regulation from ages 3 to 11 predicted individuals' income, adult physical health problems, increased substance dependence, and more criminal offenses at age 32 (Moffitt et al., 2011). These data suggest that an individual's self-regulatory capabilities are salient for predicting important outcomes across the lifespan. Thus, it is essential that supports for students' self-regulation are provided in school.

Self-Regulatory Capabilities and Student Outcomes

Self-regulation is well recognized as the foundation for school readiness and a strong predictor of future academic achievement (Blair, 2016). A range of self-regulatory capabilities have been associated with students' achievement and the academic behavior students engage with in the classroom to foster an ideal learning environment. For example, in their two-year longitudinal study of the development of cognitive and emotion regulation skills, Neuenschwander and colleagues (2013) found several aspects of student's self-regulation were associated with higher standardized achievement test

scores and higher grades. A study conducted by Brocki and colleagues (2019) also revealed that higher levels of emotion regulation in preschool predicted lower levels of inattention in adolescence. On the other hand, poor self-regulation skills put students at greater risk for ineffective interactions with the environment, leading to significant and lasting academic, behavioral, and social difficulties in school (Biederman et al., 2004).

Academic Outcomes

As children progress through grade school, the self-regulation skills necessary to meet the demands of their classroom environment increase in number and become more complex. Children begin to build the foundation for self-regulation as early as preschool, when they are instructed to follow teachers' directions (Little, 2016). Previous studies suggest strong self-regulatory skills co-occur with higher language and early literacy skills (Moll et al., 2015). For example, a study conducted by Engel de Abreu and colleagues (2014) compared the self-regulation skills (e.g., working memory, cognitive flexibility, inhibition, selective attention) of strong versus poor readers in early elementary school and found students who exhibit lower reading achievement scores also demonstrate difficulties with working memory and cognitive flexibility. Furthermore, results from a meta-analytic review that explored the relationship between self-regulation and future academic achievement outcomes showed that self-regulation in early school years was positively associated with both literacy and math achievement (Robson et al., 2020). Overall, self-regulation skills are strong predictors of early academic achievement.

Evidence suggests the association between self-regulation and academic achievement continue into the later elementary and middle school years. Nesbitt and

colleagues (2015) investigated a potential mechanism of this relationship. Their study examined the potential mediating role of learning-related behaviors in the classroom on the direct association between self-regulation skills in early literacy, language, and mathematic gains. Learning-related behaviors were characterized as (a) higher levels of involvement in learning opportunities, (b) greater frequency of participation in activities that require sequential steps, (c) more participation in social learning interactions, and (d) less instances of being unoccupied, disruptive, or in time-out. Ultimately, children's level of involvement in classroom activities, use of sequential learning behaviors (i.e., planning for learning in the classroom), and engagement in the classroom predicted academic gains (Nesbitt et al., 2015). Similarly, Jacobson and colleagues (2011) investigated the use of learning related behaviors by late elementary school students transitioning to the sixth grade. They found that student's self-regulation skills significantly predicted teacher ratings of sixth grade academic behaviors such as work habits, cooperation with teacher directives and classroom expectations, and maintaining attention to tasks. Furthermore, teachers reported that the students with poorer self-regulation in schools tended to have a more difficult time adjusting to the academic demands of 6th grade (Jacobson et al., 2011), making them more difficult to teach. The critical nature of self-regulation capabilities on outcomes related to students' academic achievement make providing timely interventions to improve struggling students' self-regulation skills necessary.

Behavioral and Socioemotional Outcomes

Behavioral regulation is a student's ability to follow school rules and classroom expectations including following the teacher's directions, remaining seated when

expected to, inhibiting disruptive behaviors during instruction, and remaining on-task during class wide, small group, and independent work (McCoy et al., 2019). Thus, behavioral regulation skills facilitate opportunities for students to engage in on-task learning-related behaviors (e.g., note-taking, asking on-topic questions). Emotion regulation skills foster positive relationships among teachers and peers by communicating emotions in a calm way, transitioning easily from one activity to another, following other people's plans, and taking peers' perspectives (McCoy et al., 2019).

A central process of self-regulation is inhibitory control, which is commonly operationalized as a child's ability to 'follow rules' and 'stop themselves' from engaging in potentially problematic behavior. A meta-analysis conducted by Schoemaker and colleagues (2013) found evidence to suggest that inhibitory control was particularly important for explaining the link between self-regulation and externalizing behaviors. Several studies have demonstrated inhibitory deficiencies in children with externalizing disorders (Ryan & Ollendick, 2018; Schutter et al., 2011; F. L. Wang et al., 2020; Young et al., 2009). Working memory and cognitive flexibility, key self-regulation skills for school, are important for facilitating the resolution of social conflicts (Ziermans et al., 2012). Even more compelling, researchers have identified a direct link between self-regulation and aggressive behaviors (Riccio et al., 2011). Additional evidence to support the association between self-regulation and externalizing behaviors are some symptoms commonly exhibited by individuals with autism, like cognitive flexibility and emotional control, that create barriers for the development of autistic students' relationships with peers and their teachers (Berkovits et al., 2017; Losh et al., 2022).

Researchers have only recently begun to investigate characteristics of the relationship between self-regulation and internalizing problems, particularly in the context of the school setting. Yang and colleagues (2022) conducted a meta-analytic study to determine the association between childhood self-regulation and the development of internalizing problems in early adolescence. Results from this study revealed that poorer self-regulation during childhood was associated with more depressive symptoms during adolescence, however, childhood executive function was not associated with anxiety in adolescence. The authors also coded the included studies for 'broad internalizing symptoms' such as depressive symptoms, anxiety, social withdrawal, somatic complaint, social stress, low energy, loneliness, peer relationship problems, low self-perception, and low self-esteem. Results from the meta-analysis also indicated that poorer self-regulation during childhood was associated with greater levels of broad internalizing symptoms in adolescence. One included study, conducted by Bufferd and colleagues (2014), found that childhood inhibitory control predicted the later onset of depression. Adding to these findings, Al-Yagon and colleagues (2020) examined self-regulation as a risk factor for socioemotional and behavioral challenges in fifth and sixth grade students. In that study, students were asked to report on their own internalizing and externalizing behavior and teachers reported on students' executive function skills. Results indicated that students' executive function skills contributed significantly to the variance in children's internalizing behavior problems.

Furthermore, Eisenberg and colleagues (2010) found that children with internalizing problems were able to exhibit behavioral control but struggled with

attention regulation, which likely impacts students' ability to learn in the classroom. A longitudinal study conducted by Nelson and colleagues (2018) measured self-regulation and internalizing problems in preschool children and followed students through late elementary school. Results indicated that poorer effortful control in preschool co-occurred with higher depression and anxiety and was significantly associated with persistent symptoms of depression and anxiety in late elementary school. Wang and Zhou (2019) identified a longitudinal relationship where peer difficulty, that is children's problematic peer interaction characterized by peer victimization and exclusion, in the third, fourth, and fifth grade independently mediated the longitudinal relationship between self-regulation and internalizing problems across elementary school years.

Importantly, self-regulation deficits appear to play a central role in neurodevelopmental and learning disabilities including specific learning disability (SLD), attention deficit hyperactivity disorder (ADHD) and autism spectrum disorder (ASD). Some studies suggest there is overlap in the self-regulation deficits exhibited by individuals with ADHD, SLD, and ASD (Marzocchi et al., 2002; Ashburner et al., 2010). For example, one study demonstrated that students with ADHD and a separate group of students with SLD exhibited impairments on multiple measures of self-regulation including inhibition, planning, and task switching (Crisci et al., 2021). Findings linking behavioral- and emotional- self-regulation skills to externalizing and internalizing problems, particularly for students with neurodevelopmental and learning disorders, provide compelling evidence that self-regulation is critical for normative development and for students' success in school. Given the significance of self-regulation capabilities

in school, this dissertation will focus on students with ADHD whose cognitive, behavioral, and emotion regulation skills lag behind their same-age peers.

Characterizing Treatment for Students with ADHD

ADHD is a neurodevelopmental disorder characterized by developmentally inappropriate self-regulation. Students with ADHD present with dysregulated attention, developmentally inappropriate levels of hyperactivity, and high levels of impulsivity that significantly impact their behavioral, socioemotional, and academic functioning across home, school, and social environments (DSM-5; American Psychological Association, 2013). With an estimated prevalence of 5 to 7% worldwide, ADHD is the most common neurodevelopmental disorder of childhood (Hinshaw, 2017; Polanczyk, et al., 2014). Research consistently indicates that individuals with ADHD experience a wide range of poor social, emotional, academic, and behavioral outcomes across the lifespan (Faraone et al., 2015). Relative to typically developing peers, children with ADHD are more likely to experience poor school-level outcomes including academic underachievement (Daley & Birchwood, 2010), low school attendance, and increased school dropout (Dembo et al., 2016; Fried et al., 2016).

Special Education Services

Students with ADHD are served in both general education and special education settings and their unique needs fall along the continuum of additional academic, behavioral, and socioemotional supports offered in the school setting. A recent study estimated 43% of students with ADHD had an individualized education plan (IEP) and 14% of students had a Section 504 Accommodation Plan (DuPaul et al., 2019). However,

estimates of the prevalence of ADHD within special education programming in the United States (US) are hindered by the lack of an explicit category that qualifies children with ADHD for special education services. In a nationally representative investigation on ADHD prevalence in special education settings, Schnoes et al. (2006) reported that the majority of students eligible within the Other Health Impairment (66%) and Emotional Disturbance (58%) categories were diagnosed with ADHD. Additionally, 20% of students eligible within the SLD category were also diagnosed with ADHD. Considering all students with special education eligibility, 15% met criteria for Other Health Impairment, 5% for Emotional Disturbance, and 32% for SLD (National Center for Education Statistics, 2022). Therefore, considerable special education resources are allocated to students with ADHD.

Findings from a recent study that reviewed the content of IEPs for students diagnosed with ADHD indicated that the majority of these students were placed in less restrictive settings with a higher student-teacher ratio, such as in a general education classroom with an aide (Fabiano et al., 2022). Regarding service provision, approximately 35% of students received counseling, 32% received occupational therapy, and 30% received speech and language therapy services. Regarding accommodations listed in students' IEPs, test modifications (63%) were most common, followed by revised test directions (55%), flexible seating and setting modifications (53%), flexible schedule (44%), support for school personnel (36%), and revised test format (23%). Additionally, 27% of students in the sample required a behavior intervention plan to be implemented within the classroom (Fabiano et al., 2022).

Self-Regulatory Interventions

Several interventions have been investigated as viable treatments to support the self-regulation skills of students with ADHD. A recent meta-analysis conducted by Fabiano and colleagues (2021) investigated the available pool of psychosocial treatment studies aimed to treat ADHD and synthesized prior studies according to inclusion of control group, treatment type, outcome measure, and informant. Treatment type categories were defined as behavioral interventions (i.e., teacher classroom management, behavioral peer interventions, family-problem solving interventions), training interventions (i.e., working memory training, organizational skills training, social skills training, emotion regulation training), and additional interventions (e.g., academic supports including accommodations and modifications, self-monitoring; Fabiano et al., 2021). A small to moderate effect size emerged for behavioral interventions and large effect sizes emerged for teacher ratings of students' behavior following classroom management interventions. Therefore, results support the use of behavioral interventions to treat students' self-regulatory difficulties. However, the size of the effect for behavioral interventions varied across treatment type and informant. For training interventions, teachers indicated no evidence of effectiveness on treating ADHD-related behaviors in the classroom. Regarding additional treatments, only one included study investigated the efficacy of academic accommodations as a stand-alone treatment for ADHD-related challenges in the classroom. This study yielded modest to ineffective impacts of academic accommodations on outcome measures of academic growth (Fabiano et al., 2021). Given the variability in effectiveness for school-based

interventions and accommodations designed to support students with ADHD, and considering emerging evidence that the size of the effect may depend on type of treatment, additional research is needed to understand the factors that may influence students' response to an intervention.

Optimizing Intervention Outcomes

A recent review of psychosocial interventions efficacious for children and adolescents with ADHD identified a research to practice gap in the use of evidence-based interventions. For example, in schools, only 32% of students with ADHD are reported to receive classroom behavior management (DuPaul et al., 2019). DuPaul and colleagues (2020) attribute the underutilization of evidence-based psychosocial strategies to the limited training that educational professionals receive. They offered six recommendations for future directions across two stages of intervention development. At the initial stage of intervention development, DuPaul et al. (2020) recommend (1) identifying and leveraging mechanisms of change, (2) examining impact of youth development on treatment mechanisms and outcomes, and (3) designing intervention research in the context of a life course model. Within the implementation and dissemination stage, they recommend investigating strategies to (4) enhance access to evidence-based treatment, (5) optimize implementation fidelity, and (6) examine and optimize costs and cost-effectiveness of psychosocial intervention. This dissertation aims to elucidate potential mechanisms of students' response to school-based self-regulatory interventions by investigating teachers' knowledge about and use of evidence-based self-regulatory interventions designed for students with ADHD.

Teachers' Perceptions, Attitudes, and Knowledge Concerning Students with ADHD

Teachers play an essential role in supporting students at multiple levels of the identification to intervention process in schools (Topkin et al., 2015). Regarding identification, teachers are frequently charged with referring students in need of additional academic and behavioral supports for special education evaluation and intervention (Lee, 2014). They also participate in the assessment of students with ADHD, as they are commonly asked to report on current behavioral concerns and complete ADHD symptom checklists (Tahillioglu, 2021). Regarding intervention, many students with ADHD receive additional behavioral supports in their general education classroom, academic support in small groups, and academic support in specialized academic instruction settings. Thus, both general and special education teachers are tasked with implementing interventions with students with ADHD or providing the accommodations and modifications documented in students' IEPs and 504 plans (Evans et al., 2018).

However, prior research has identified gaps in teachers' knowledge about students with ADHD (Latouche & Gascoigne, 2019). General education teachers, in particular, lack knowledge and training related to the symptoms of ADHD and effective supports for students with ADHD (Flanigan & Climie, 2018). Teachers, however, are responsible for managing the manifestations of symptoms of ADHD exhibited by students in the classroom (e.g., fidgeting, leaving their seat, calling out unexpectedly, peer conflict). Considering the key symptoms of ADHD (e.g., attention dysregulation, off-task behavior, hyperactivity, impulsivity), a great deal of resources are required to support the success of students with ADHD across settings. Thus, it is not surprising that teachers report that

students with ADHD are more difficult and more stressful to teach (DeShazer et al., 2023; Greene et al., 2006). A lack of knowledge coupled with the responsibility to serve these students in the classroom may contribute to pessimism about students with ADHD, a lack of teacher self-efficacy in their ability to effectively support students with ADHD (Krtek et al, 2022), and negative student-teacher interactions (Maclean et al., 2023).

Evidence suggests multiple and compounded variables contribute to teachers' stress and attitudes when educating students with ADHD. Teachers' attitudes and interactions with students may affect their ability to effectively facilitate the success of students with ADHD. For example, evidence suggests that teachers reduce the academic expectations of students with ADHD, regardless of demonstrated ability on subject-specific tests (Metzger & Hamilton, 2021). Additionally, Moore and colleagues (2016) systematically reviewed non-pharmacological interventions for ADHD in school settings and identified three key barriers influencing the effectiveness and implementation of these interventions in schools: (1) the relationships students with ADHD have with their peers and their teachers, (2) attributions teachers and educational staff make about the etiology of ADHD, and (3) stigma attached to ADHD and intervention attendance. A key finding that illustrates the latter 2 issues is that educational staff tend to focus on biological factors as an explanation for ADHD (Ljusberg, 2011a; McMahon, 2012) or reject the validity of the syndrome and attribute ADHD symptoms to difficulties in the student's home (Singh, 2011). Both attributions neglect important factors for intervention at the school level, namely, the student's skills, self-efficacy, relationships at school, and their classroom environment. Teachers who hold these beliefs may narrow the focus of

interventions that are selected to support the student. This would likely result in school staff neglecting to consider potential mechanisms of change in the school environment, such as teacher-level factors, implementation fidelity, contingency management, educational accommodations, and modifications to the academic curricula or school environment to support student success. Thus, an intervention that targets teacher beliefs about the symptoms of ADHD may be promising for improving teachers' interactions with students with ADHD.

Evidence also suggests that student-teacher closeness, as reported by the teacher, is an important teacher-level factor that influences student behavior in the classroom (Zendarski et al., 2020). DeShazer and colleagues (2023) found that teachers' overall work-related stress and conflict in the student-teacher relationship strengthened the association between ADHD symptom severity and teacher stress. Furthermore, results suggested that student-teacher relationship closeness mitigated the association between ADHD symptom severity and teacher stress such that teachers who reported having a closer relationship with their students with ADHD who exhibit externalizing behaviors reported less distress when working with the student. Conversely, when teachers reported lower student-teacher relationship quality an increase in student-related teacher stress was also reported (DeShazer et al., 2023). Clearly, the student-teacher relationship is an important predictor for the outcomes of both students with ADHD and the teachers who serve them. Taken together, researchers should consider teacher-level factors when investigating the variables that influence school-based self-regulatory interventions designed for students with ADHD.

Facilitators of Positive Treatment Outcomes for Students

Researchers have long called for the investigation of facilitators and barriers that influence implementation of interventions designed for students with ADHD (Hinshaw, 2007). However, prior studies have sparsely measured teacher-level factors as an influence on student outcomes. Instead, the majority of research in this area has assessed teacher knowledge about symptoms of ADHD and the interventions recommended to treat those symptoms in the school setting. For example, Stormont and colleagues (2011) surveyed teachers' knowledge about behavior and their use of evidence-based classroom management practices by asking general and special educators about their prior training and current practices. Results suggested that all participating teachers were generally able to identify evidence-based practices for behavioral challenges (e.g., identify what triggers and reinforces a problem behavior). Teachers also reported that they are aware of the issues that need to be considered when selecting evidence-based practices. However, less than half of teachers reported feeling confident about the impact the interventions they select have on students. Stormont and colleagues (2011) also found that special educators were more likely to endorse confidence in their ability to select appropriate interventions to meet their students' needs. General educators in this study reported a lack of confidence in their ability to select interventions, regardless of education level and prior training obtained.

A study by Akdağ and colleagues (2022), further supports that general educators report a lack of knowledge and preparedness to support students with ADHD. However, they observed that the additional training provided to special educators may prove

particularly useful for supporting students with ADHD. Specifically, special educators' increased understanding about available interventions, data-based decision making, and experience working with students with neurodevelopmental disorders and unique learning needs likely better equip them to support students with ADHD. However, little research has explored the differences in special educator and general educator knowledge of evidence-based practices to support students' self-regulation. The authors identify pre-service teacher preparation programs as a potential mechanism of intervention to build teachers' knowledge about ADHD symptomatology and evidence-based interventions prior to teachers' choice to specialize or gain specific certifications (Akdağ, 2023). Thus, one mechanism to facilitate the academic success of students with ADHD may be better equipping teachers with necessary knowledge and tools to support these students.

Overall, scant research has responded to the call for optimizing treatment for students with ADHD. Findings from research in other fields can inform what teacher-level factors may be important for implementation of interventions for these students. Studies have found that adequate training prior to intervention implementation, teachers' school level (i.e., elementary, middle, high school), teachers' professional role (i.e., general educator versus special educator), teachers' self-efficacy in their ability to service high needs students, and their ability to observe change in students' target behaviors are important factors for the sustainability of behavioral interventions (Filter et al., 2016; Kincaid, 2007; Lohrman, et al., 2013; Tyre et al., 2018). Thus, a logical next step in optimizing outcomes for students with ADHD is to conduct research that critically

examines the barriers and facilitators of school-based self-regulatory interventions, particularly teacher-level factors.

Purpose

This dissertation seeks to investigate teacher-level factors as a viable mechanism for change in the process of rectifying academic, behavioral, and socioemotional outcomes for students with ADHD. Given this overarching goal, the first study of this dissertation sought to explore the teacher-level factors salient for effective implementation of school-based interventions for students with ADHD. The second study of this dissertation sough to evaluate the effectiveness of a pre-service teacher training designed to target two teacher-level factors identified as important for implementation of interventions: (1) knowledge about ADHD and (2) teacher self-efficacy. Finally, a discussion centering on future directions for the field of school-based ADHD intervention research will identify implications for educators and school psychologists.

II. Research Studies

Rationale for Study 1

Students with ADHD exhibit challenges with cognitive, behavioral, and emotional self-regulation skills at school (McDougal et al., 2023). A considerable proportion of children with ADHD require special education services (Hustus et al., 2020). Even so, students with ADHD frequently exhibit poorer grades and higher rates of high school dropout (Arnold et al., 2020). Students with ADHD are often placed in general education classrooms and receive push-in special education supports (DuPaul et al., 2019). Thus, general education teachers are often charged with delivering accommodations to improve students' outcomes (Akdağ, 2023). Taken together, it is imperative that general education teachers are well equipped to identify and implement evidence-based interventions to improve outcomes for students with ADHD. Several academic, contingency management, and cognitive behavioral interventions have been determined as effective in targeting the challenges experienced by students with ADHD (DuPaul et al., 2012), including behavior modification techniques (Miranda et al., 2006); peer tutoring, self-regulation (Trout et al., 2007); and self-monitoring (Reid et al., 2005). Although several school-based interventions have been investigated for students with ADHD, little attention has been allocated to better understand the barriers and facilitators of these school-based interventions. This study conducted a small-scale, in-depth literature review to explore prior work that has identified teacher-level factors, such as knowledge of ADHD and teacher self-efficacy, that might serve as barriers or facilitators for school-based interventions. The results of the literature review highlight the need for

future work to better understand teacher-level factors that influence the effectiveness of school-based interventions designed to support students' self-regulatory capabilities.

Study 1: ADHD Interventions in Schools: A Systematic Review Characterizing the Association Between Teacher Factors and Intervention Outcomes.

Abstract

Teachers frequently report that the pre-service training they received did not prepare them to manage ADHD-related behavior. Although there has been a recent rise in studies aimed at increasing teachers' knowledge of ADHD, there remains a need to address whether teacher factors (e.g., knowledge about ADHD, experience working with students with ADHD) influence the effectiveness of interventions targeting ADHD symptoms. The aim of this small-scale, in-depth literature review was to identify and explore studies that have investigated teacher-level factors alongside intervention effectiveness for students with ADHD. A literature search was conducted to identify studies on the topic of ADHD interventions that: (a) demonstrated the use of a school-based intervention aimed at supporting students with an ADHD diagnosis, (b) measured a teacher factor, and (c) documented student outcomes. The search was limited to peer review articles published between 2006-2020 and written in English. Within the broad body of work regarding school-based ADHD intervention research, the search identified a small subset of articles that addressed this specific area. An in-depth narrative synthesis of these articles explored the studies' characteristics and outcomes. The synthesis draws attention to the under-researched question of whether teacher factors are influencing or moderating an intervention's effectiveness. Results highlight the need for further research investigating teacher level factors as possible explanatory variables for the effectiveness

of an intervention. Investigating teacher factors may provide information about barriers and facilitators for school-based ADHD interventions.

Note: Monteiro, E.*, Donham, A., & Klaib, M. (2022): Teacher characteristics and ADHD intervention outcomes in schools, *Educational Research*, DOI: 10.1080/00131881.2022.2087711

*lead and corresponding author

Introduction

Attention deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder that is marked by pervasive functional impairment and characterized by developmentally inappropriate levels of inattention and/or hyperactivity/impulsivity that significantly impact behavioral, social, and academic functioning (Barry et al., 2002). ADHD emerges in childhood and is understood as a chronic developmental disorder whose symptoms can persist across the lifespan (Barkley, Murphy, and Fisher 2010). Although there are large variations within and between countries, worldwide prevalence rates are estimated at 7% (Mezzanotte, 2020). Evidence suggests that symptoms of ADHD significantly impair student functioning in school settings. For example, most students with ADHD exhibit challenges with completion of academic work (Barry et al., 2002; Birchwood and Daley, 2012) and with academic engagement (Vile Junod et al., 2006) in the classroom. These academic difficulties are further exacerbated by the inattention, disorganization, and tendency to become off task (Langberg et al., 2011b) that are commonly experienced by students with ADHD. These students can also exhibit behavioral problems, including aggression and noncompliance (Barkley, 2006), as well as social impairment, especially in interacting with peers and adults (Hoza, 2007). In addition, students with ADHD are more likely to have poorer grades, be identified for special education (Loe and Feldman, 2007), and to be at risk of being retained a grade and dropping out of high school (Barbaresi et al., 2007; Galéra et al., 2009). In the face of these compounded challenges, it is imperative that schools support the academic, behavioral, and socioemotional development of students with ADHD.

Since the 1990s, considerable research activity has been dedicated to investigating effective treatment methods for ADHD in school settings, leading to the generation of a substantial body of valuable literature. As a result, several meta-analyses have aimed to characterize the school-based behavioral, psychosocial, and academic interventions designed for students with ADHD (e.g., Moore et al., 2015; Pfiffner and DuPaul, 2015), and how they compare with pharmacological interventions. A meta-analysis conducted by DuPaul, Eckert, and Vilardo (2012) suggested that, overall, school-based interventions for students with ADHD have a significant and positive effect on student academic and behavioral outcomes. The meta-analysis classified school-based interventions into three categories: (a) academic interventions, (b) contingency management, and (c) cognitive behavioral interventions. In the context of the metanalytic study conducted by DuPaul and colleagues (2012), academic interventions were considered interventions that focused on manipulating antecedent conditions like academic instruction (e.g., peer tutoring) or academic materials (e.g., organizational skills). Contingency management interventions used reinforcement (e.g., praise) or corrective measures (e.g., corrective feedback) to improve appropriate behaviors. Finally, cognitive behavioral interventions were interventions that focused on self-control skills (e.g., self-instruction) and the student's reflective problem-solving strategies (e.g., self-management system) to regulate behavior. Findings indicated that combined academic and contingency management interventions yielded the greatest effects on student outcomes; a moderate to large effect on behavior was found for within-subject design studies where participants were measured against themselves across time. Additionally, a large effect size was apparent for behavior and

academic outcomes for single-subject design, where an individual or single group (e.g., classroom) was studied across design conditions. Effect sizes for cognitive behavioral interventions were smaller relative to both categories of interventions.

Another key finding that emerged from this study was that interventions implemented in general education classrooms yielded similar effects for both academic and behavioral outcomes relative to strategies used in special education (DuPaul et al., 2012). This is notable because students with ADHD typically spend the majority of their time in general education classrooms receiving push-in services (Turnbull et al., 2004). In such situations, services are provided by the specialist *within* the general education classroom, where the students with ADHD remain with their typical peers, rather than the students being taken out to a separate classroom for services.

A recent review conducted by DuPaul et al. (2020) outlined the multiple evidence-based psychosocial interventions for children and adolescents with ADHD, including behavioral parent training, behavioral classroom management, behavioral peer interventions, and organization programmes. The researchers detailed the history of evaluation of short-term efficacy trials using a fragmented and unsustainable implementation approach, emphasizing the need to move towards the development and evaluation of a more comprehensive, integrated, multi-pronged approach. It is argued that adoption of a more integrated system of care for ADHD students would help to narrow the research-to-practice gap. Recommendations for adoption of this approach include identifying and leveraging mechanisms of social change (e.g., teacher investment),

enhancing access to evidence-based treatment, optimizing implementation fidelity, and examining cost-effectiveness.

In this small-scale, in-depth literature review we explore teachers as a potential mechanism of change by reviewing studies that have investigated teacher-level factors concurrently with intervention effectiveness for students with ADHD. By investigating this important and complex area, we acknowledge the broader context, including that teacher training programmes and teacher in-service professional development would likely need to evolve, and would require appropriate resourcing, to better enable teachers to support learners with ADHD. Before presenting our review in greater detail, we seek to situate our work further by considering relevant background literature.

Teachers' Roles in Supporting Students with ADHD

There are two main mechanisms through which school-based support services are formally provided to eligible students with ADHD in the USA: Section 504 of the Rehabilitation Act of 1973 and Individuals with Disabilities Education Improvement Act (IDEA, 2004). These two acts outline the eligibility requirements and provide the framework for support services. In a follow-up of the multi-site multi-modal treatment study of ADHD (Murray et al., 2014), the authors report that, overall, just over half of the students with a history of ADHD were accessing services through an Individual Education Plan (IEP) or 504 plan. Within these mechanisms for special services, teachers play an essential role in supporting students. This is especially true for students with ADHD, considering that teachers are often tasked with referring students who are at risk

of falling behind, in addition to implementing interventions to support previously identified students' success (Groenewald et al., 2009; Topkin et al., 2015).

Though, evidence suggests that teachers may be inadequately prepared to support students with ADHD effectively, due to limited training (Martinussen et al., 2011). It is likely that these reports are related to teachers' concerns about behavior problems in the classroom (Kos et al., 2004). Studies have identified gaps in teacher knowledge of symptoms that characterize a diagnosis of ADHD (Guerra et al., 2017; Sciutto et al., 2016), as well as a lack of sufficient knowledge of evidence-based interventions used to support students with ADHD (Arcia et al., 2000; Lawrence et al., 2017; Vereb & DiPerna, 2004). These findings might help to explain the consistent reports from teachers that students with ADHD are more stressful to teach (Dicke et al., 2014).

Teacher Factors and School-based ADHD Interventions

In setting forth critical steps for improving interventions, Hinshaw (2007) called for future research to focus on gaining a better understanding of the salient moderators and mediators of intervention research for individuals with ADHD. Given that teachers must have knowledge of the student, understand the ways ADHD-related problems manifest in school, and be aware of available school-based support services in order to select an effective intervention for the student, it is necessary for teachers to receive adequate training to support this decision-making process. For example, a salient teacher factor for implementing an intervention might be lack of knowledge about ADHD, which can influence the intervention's effectiveness. Gaastra and colleagues (2016) also recommended exploring teacher factors – specifically, teaching experience and teachers'

personality characteristics – as possible variables influencing the effectiveness of classroom interventions for students with ADHD. Kos and colleagues (2006) point to additional teacher factors, including teachers' experience educating students with ADHD and teachers' attitudes and perceptions of students with ADHD, especially as they relate to students' hyperactive and disruptive behavior.

Despite several studies exploring how best to address the previously discussed gaps in teacher knowledge (e.g., Corkum et al., 2019; Latouche and Gascoigne, 2019), few studies have investigated whether teacher factors, such as knowledge, attitudes and perceptions, are important *predictors* of intervention outcomes for students with ADHD. Some recent studies have investigated the influence of teacher perceptions or knowledge of ADHD on interactions between teachers and students with ADHD. Data were gathered on how teachers viewed and rated the child's ADHD-related behavior and explored how these indicators were influenced by the teacher's personal perceptions (Fairbanks & Stinnett, 1997; Greene, 1995). Several studies have pointed to the possible existence of a link between teacher factors and the effectiveness of the interventions, although this link remains insufficiently researched in the mainstream ADHD literature. For example, influential studies such as the Multimodal Treatment Study of Children with Attention-Deficit/Hyperactivity Disorder (MTA) did not include teacher factors (as defined by this paper) in its outcome measures (MTA Cooperative Group 1999, 2004). Thus, an improved understanding of the relationship between teacher-level factors and intervention effectiveness will support to optimal design of interventions and will, in turn, improve the outcomes of students with ADHD.

This gap in ADHD intervention research was identified at least as far back as the 1990s, when Greene (1995, 81) remarked that the lack of research on teacher factors was a 'striking omission', viewing the conceptualization of ADHD as incomplete without the consideration of teacher-level factors. As ADHD is a familiar condition, it is essential to consider the environmental factors that might be affecting the severity of the problematic ADHD characteristics (Greene, 1995), especially within a school setting. Students spend the majority of their days in a classroom with their teachers. Since teachers are often responsible for implementing classroom-based interventions, it is critical to examine the influence that teachers have on the effectiveness of the intervention they are implementing for students with ADHD, as this might account for some portion of the individual variability in student outcomes. Teachers face considerable stress in the classroom, and their stress is amplified when they are required to manage difficult problematic behaviors resulting from ADHD symptoms. In situations where teachers have tried interventions that have not yielded satisfactory outcomes for the students, teachers may feel discouraged or frustrated by lack of change in target behaviors.

Sherman and colleagues (2008) advanced Greene's work by reviewing the literature on teacher-level factors, with the purpose of further investigating the influence of teacher factors on student outcomes. Their review examined studies from 1966 to 2008 but found that this gap in ADHD research persists, with few studies having focused on this undefined territory. Of the studies that did examine teacher factors in relation to intervention effectiveness and student outcomes, some findings indicate that the success of interventions may indeed be partly due to the acceptability of the intervention to

teachers, rather than the efficacy of the intervention alone (Power et al., 1995). Findings also suggested that the teachers' beliefs about effectiveness and appropriateness of an intervention influenced whether the intervention would be used in the classroom (Witt et al., 1984). Though the complex and important relationship between teacher factors and intervention effectiveness is not yet fully understood, Sherman et al., (2008) noted that these findings warrant further research to examine the connection between teacher factors and intervention effectiveness, which may influence student outcomes, echoing Greene's call in 1995 for additional work to explore this area.

Purpose

There is a clear need for a more comprehensive understanding of teacher-level factors that may be facilitate or impede the effectiveness of school-based interventions for students with ADHD. The aim of this small-scale literature review was to conduct an in-depth examination of a subset of studies that investigated both teacher-level factors and the effectiveness of a school-based intervention designed for students with ADHD.

Method

To conduct the review, the following steps were taken: researchers stated the purpose of the review, identified inclusion and exclusion criteria, defined a search strategy, established criteria for evaluation of studies, and extracted data. The review approach was based on the PRISMA protocol (Moher et al., 2009). Systematic searches were completed using Education Source, PsycInfo, Web of Science, and ERIC databases with the following Boolean search terms: ["ADHD" OR "attention deficit hyperactivity disorder" AND intervention* OR program* OR treatment* AND teacher* AND

(attitudes* OR beliefs* OR knowledge* OR training* OR experience*)]. The search was limited to articles published in peer-reviewed journals from 2006 to 2020. This is because Sherman and colleagues (2008) included articles published between 1966 and 2006, only peer-reviewed articles published after 2006 were considered.

Inclusion criteria

Articles were considered eligible for review if they were written in English and were published between the years of 2006-2020 in a peer-reviewed journal. Articles also needed to (a) demonstrate the use of a school-based intervention aimed at supporting students with a diagnosis of ADHD, (b) document student outcomes after the intervention, (c) measure a teacher factor as defined by Sherman and colleagues (2008): teacher factors included teachers' perceptions (i.e., attitudes and beliefs) about ADHD as a disorder, as well as their perceptions about students with ADHD. Sherman et al., (2008) also identified teachers' philosophies about interventions, job satisfaction, experience (e.g., related professional development training), and tolerance levels with respect to behavior in the classroom as teacher factors relevant to determining the effectiveness of an intervention. After conducting the searches, researchers identified only a small subset of published literature that met these criteria.

Analysis

Three doctoral graduate students independently scanned all titles and abstracts, then identified relevant articles to include in the review. From each study, information was extracted about: the country of origin, sample size, type of school (e.g. private or public), mean age of students, grade of students, other student demographics (e.g. sex,

ethnicity), study design (e.g. between group, within group, single case), type of intervention, student outcomes measured, teacher factors measured, population receiving intervention (e.g. classroom or individual), and intervention duration (if applicable). The initial search generated 1,122 articles on the topic of ADHD interventions and teacher factors. There were 397 duplicates that were removed before researchers began the abstract screening of 725 articles. In total, 679 articles were excluded at the abstract screening stage, for several different reasons (see Figure 1 for details), including that they did not meet one or more of the following criteria: (a) measured a teacher factor, (b) reported student outcomes, or (c) implemented in a K-12 grade (i.e., approx. student ages 5-18) school setting. Next, the remaining 46 full-text articles were reviewed using the same inclusion criteria. Of those studies, six met the criteria. Finally, of the 209 articles reviewed from the archival search (i.e., review of resources referenced in the already-included articles), three additional articles met the criteria for inclusion, summing to a total of nine articles to be scrutinised in depth for the purpose of this study.

As part of the literature search procedure, consistency between the three coders was checked. For this process, 226 articles were randomly selected from the 725 articles that met criteria at the abstract review stage. Each coder independently extracted data and coded abstracts to decide whether the described study met the inclusion criteria. Agreement was considered acceptable if it met or exceeded 80% agreement (Kazdin, 2011). Overall, the raters were in agreement for 1,016 criteria out of the 1,130 total criteria (90%) across studies.

Results

Our literature search identified nine peer-reviewed studies that met the strict inclusion criteria and, thus, would help us to gain a better understanding of teacher factors in the context of interventions for students with ADHD. This section provides an in-depth narrative synthesis of this small subset of literature. Together with the discussion section that follows, it also offers a consideration of gaps in the literature and reflects on the potential for future work to address these important areas of inquiry.

Characteristics of Included Studies

Of the nine included studies, eight were conducted in the United States (Coles et al., 2015; Erchul et al., 2007; Erchul et al., 2009; Fabiano et al., 2010; Owens et al., 2017, 2018; Power et al., 2009; Zentall & Javorsky, 2007), and one study was conducted in the Netherlands (Veenman et al., 2018). In addition, the included studies reported various demographic characteristics of their sample, such as age and grade of participating children, gender, and ethnicity. Of the nine included studies, two studies used between-subjects group design (Owens et al., 2017; Power et al., 2009), six used within-subjects design (Erchul et al., 2007; Erchul et al., 2009; Fabiano et al., 2010; Owens et al., 2018; Veenman et al., 2018; Zentall & Javorsky, 2007), and one study used a single subject, or case study, design (Coles et al., 2015). Table 1 summarizes the key characteristics of the studies included in this review.

Findings were synthesized within three categories: (1) consultation, (2) teacher training/professional development, and (3) multicomponent intervention. This categorization was determined based on intervention type and outcome measures (see

Table 1). For each category, study outcomes are discussed before teacher-level factors are explored in further detail.

Intervention Outcomes

Consultation

Erchul et al., (2007) investigated the effectiveness of individualized academic intervention (IAI) consultation on the outcomes of 42 students with ADHD (grades 1-4; average age of 8.7 years). Specifically, teacher-consultant interactions during the Problem Identification Interview (PII) were analysed to determine whether those interactions were related to consultation and student outcomes. The *Relational Communication Control Coding System* (RCCCS; Rogers and Farace, 1975) was used to assess the degree to which the teacher was domineering (i.e. attempts to influence the consultant) and showed dominance (i.e. successful influence) during consultation. Results indicated that high teacher dominance was associated with high treatment integrity. The *Behavior Intervention Rating Scale* (BIRS; Elliott and Von Brock Treuting 1991) was used to assess behavior change, and the *Goal Attainment Scaling* (GAS; Kiresuk et al., 1994) was used to assess student progress toward goals. The data indicated that teacher dominance was associated with teacher ratings of intervention effectiveness and student progress toward goals, suggesting that successful teacher influence may be related to positive outcomes for the student.

Erchul and colleagues (2009) examined the effectiveness of behavioral consultation at improving outcomes for 20 elementary school teachers, and 20 elementary students with ADHD (average age of 8.5 years). The Intensive Databased Academic

Intervention (IDAI) consultation model, which involves the problem-solving process and data-based decision making, was utilized to design targeted academic interventions for participating students with ADHD. Specifically, teacher-consultant interactions during the Problem Analysis Interview (PAI) were analysed to determine whether those interactions were related to consultation outcomes. The impact of teacher influence – including the degree to which the teacher was domineering (i.e., attempts to influence the consultant), and teacher dominance (i.e., successful influence) – on treatment integrity, intervention acceptability, and intervention effectiveness was analysed. Interestingly, and in contrast with Erchul and colleagues (2007), teacher influence was found to be *negatively* associated with outcomes. It is important to note the mixed findings between the studies here with regard to the role of teacher dominance on intervention effectiveness. In other words, results suggested that teachers were less likely to implement proposed interventions with integrity when they tried to influence the consultation process. Erchul and colleagues (2009) acknowledged the contradictory results with Erchul and colleagues (2007) and hypothesized that the competing results may be explained by the difference in objectives across the two types of interviews used in each study. Specifically, the authors reasoned that the differing conversations across interviews likely resulted in different verbal behaviors exhibited by the consultant, some of which led to a higher amount of teacher domineering.

Owens and colleagues (2018) investigated the effect of teacher behaviors on student behaviors in the classroom. All 55 participating elementary school teachers of kindergarten (ages 5 to 6) through 5th grade (ages 10-11) classrooms were provided with

consultation about classroom management practices, such as implementing a daily report card (DRC), throughout the study. Classroom observations using the *Student Behavior–Teacher Response Observation Rating System* (SBTR; Pelham et al., 2008) were conducted to assess teacher responses to student behavior, including the use of praise and commands, as well as frequency counts of student rule violations. Results suggested that, in the case of class wide challenging behavior, higher percentages of appropriate responses by the teacher to problem behavior were significantly associated with lower rates of problem behavior in the classroom, although effective commands and specific praise from the teacher were not.

Teacher Training and Professional Development

Zentall and Javorsky (2007) compared and evaluated professional development opportunities for teachers, investigating the effectiveness of three in-service programmes that placed attention on knowledge, understanding and/or functional-assessment interventions. Forty-nine teachers were randomly placed in one of three in-service training groups: the local education agency (LEA) treatment group or a university treatment group (UT1 and UT2). The LEA training focused on the assessment and diagnosis of ADHD and interventions at the school-level, classroom-level, and home-level. The university training focused on the characteristics and assessment of ADHD, behavioral management, functional assessment, and goal setting. The *Classroom Behavior Tally Checklist* (CBTC; Zentall & Javorsky, 2007) was completed by teachers to assess their responses to student behavior, such as providing reinforcement or punishment. Additionally, 30-minute observations were conducted using the *Classroom*

Observation Checklist (Zentall & Javorsky, 2007) to assess the extent to which teachers carried out the interventions taught in the in-service training. Lastly, teachers completed the *Classroom Environment Scale* (CES; Moos & Trickett, 1974). and the *Mainstreaming Empathy Scale* (MES; Larrivee & Cook, 1979) to assess their perceptions of their ability to teach and support students with behavioral and/or learning difficulties. After the completion of the training (regardless of type of training), teachers reported improvements in their confidence in teaching students with ADHD as well as their perceived ability to provide interventions and/or accommodations to these students. In addition, gains associated with completing the treatment program included improved teacher ratings of their students' social skills.

Veenman and colleagues (2018) implemented an 18-week teacher training programme focused on providing psychoeducation about ADHD and explicit instruction on how to implement behavioral classroom management strategies. Regarding teacher factors, years of teaching experience and class size were included as moderator variables in the analysis. Findings suggested that teacher variables did not have an impact on intervention effectiveness. The study included students ages six to thirteen, and the following student variables were included as potential moderators: age, gender, socioeconomic status (SES), severity of ADHD symptoms, severity of problem behavior, anxiety, social skills, and co-morbid problem behaviors. Results suggested there were larger programme effects for older students and for students from highly educated families. Meanwhile, the intervention had a smaller beneficial impact on students with

comorbid behavior or anxiety problems. The intervention was also effective for improving the social skills of participants with low levels of peer acceptance.

Multicomponent Interventions

Owens and colleagues (2017) conducted a study examining the impact of a multicomponent consultation intervention on the knowledge, skills, and beliefs of participating elementary school teachers (N = 58). The multicomponent intervention package consisted of consultation with motivational interviewing and bi-weekly performance feedback, implementation of a daily report card (DRC) intervention with the participating elementary student (ages 5 to 11) with or at risk of ADHD, weekly receipt of classroom management fact sheets, and a values assessment. This multicomponent intervention targeting teacher knowledge, skills, and beliefs was compared with a more traditional consultation model consisting of consultation following the problem-solving process, bi-weekly performance feedback, and implementation of a DRC with the participating student with or at risk of ADHD. The following teacher outcomes were assessed: knowledge of behavioral principles, knowledge of ADHD, and perceived locus of control. Additionally, data on the frequency that praise was used by the teacher and how the teacher responded to student rule violations were collected during 15- 45-minute classroom observations. Overall, teachers in both conditions demonstrated significant improvements in their classroom management skills including use of praise and appropriate responses to student rule violations. Results from a latent class analysis showed evidence for two teacher profiles: (1) highly knowledgeable teachers with an internal locus of control regarding student failure and (2) less knowledgeable teachers

with an external locus of control who assumed less responsibility for students' failures. Results suggested that teachers with lower baseline knowledge exhibited higher levels of growth in key outcomes following the multicomponent consultation intervention compared to the traditional consultative approach.

Coles and colleagues (2015) used a case study design to investigate possible barriers to integrity in terms of teacher implementation of classroom behavior management strategies. The study included two participating student-teacher dyads. The two participating teachers received a three-hour in-service training focused on understanding ADHD, using behavior modification strategies, using classroom management strategies, and implementing a Daily Report Card (DRC). Teachers also engaged in bi-weekly consultation sessions, which had a (a) knowledge component, (b) skills component, and (c) beliefs and values component. The following two measures were administered to the teachers at pre-intervention, mid-intervention, and post-intervention to evaluate teacher progress: a 24-item true/false measure to assess teacher knowledge about ADHD symptoms/treatment and a 10-point Likert scale evaluating teacher beliefs about their self-efficacy regarding DRC implementation. Respective progress for two 8-year-old students with ADHD was measured based on the frequency of problem behaviors according to data from the DRC and achievement scores on the *Academic Performance Rating Scale* (APRS; DuPaul et al., 1991). Results demonstrated that one of the teachers exhibited greater knowledge of ADHD and behavioral principles, as well as greater confidence in DRC implementation post-intervention. For this student-teacher dyad, teacher provided praise increased and, in response, the students' off-task

behavior decreased, and work completion increased. In contrast, the second teacher exhibited initial gains in knowledge and self-efficacy. However, ultimately, knowledge and self-efficacy decreased post-intervention. Interestingly, target behaviors of the student still improved post-intervention. Overall, these findings evidence mixed support for the multi-component intervention developed by Coles and colleagues (2015). Authors attribute the surprising result for the second teacher's outcomes to her reported feelings of guilt related to providing the student with consequences in response to target behaviors, a key component of the DRC.

Fabiano and colleagues (2010) evaluated a DRC behavioral intervention, with 33 students with ADHD (ages six to 12 years) in special education placements assigned randomly to an intervention and compared to 30 children in a business-as-usual control condition. For the intervention group, the student's classroom teacher completed the DRC daily, which involved providing ratings on the student's progress toward their goals and giving the student feedback on their progress. Consultation was also provided to each classroom teacher monthly. At the conclusion of the intervention, teachers completed the *Student–Teacher Relationship Scale* (STRS; Pianta, 2001). However, results suggested that there were no differences in student-teacher relationship when comparing the control and intervention group. Regarding student progress, results indicated positive effects for the intervention group in terms of IEP goal attainment and classroom functioning observations, and teacher ratings of disruptive behavior and academic productivity. However, there was no incremental improvement resulting from the intervention in terms of academic achievement, teacher ratings of ADHD symptoms or impairment.

Power and colleagues (2009) evaluated two programmes for parents of students with ADHD (Grades 2-6; ages seven to 12 years old). Forty-five families and teachers participated in Family School Success (FSS), which is a multicomponent intervention that included parent education, conjoint behavioral consultation, the implementation of a DRC, and behavioral homework interventions. A second group of forty-eight families and teachers participated in Coping with ADHD through Relationships and Education (CARE). CARE is a behavioral parent training programme focused on parent education. Teacher factors that were measured included: teacher engagement in the intervention, teacher support for homework, and the parent-teacher relationship. Results evidenced that as students' grade level increased, teachers in the FSS group had lower levels of intervention engagement, whereas engagement of teachers in the CARE group remained stable across grade levels. Further, in terms of the relationship between the family and the school, results emerged for the association between the level of teacher intervention involvement and the degree of collaboration between the family and the school in both intervention conditions. Regarding student outcomes, results indicated that there was not a significant correlation between ADHD symptom severity and teacher intervention engagement in either the FSS or CARE condition.

Teacher Factors

Consultation is the interactive process of a consultant, or expert, providing their knowledge with regard to a current work problem when the consultee, such as a teacher, is having some difficulty in the consultant's specialized area of work (Caplan, 1963). According to Erchul and Martens (2010), a consultant's role is to serve as a change agent,

and, in the school setting, ‘change’ refers to the purposeful alteration of beliefs, attitudes, or behaviors, of children, adolescents, and adults. Six of the nine included studies (Coles et al., 2015; Erchul et al., 2007, 2009; Fabiano et al., 2010; Owens et al., 2017, 2018) intervened with teachers using a consultative model. Regarding teacher influence, it is notable that teachers’ relational communication skills, specifically dominance, influenced the consultative process, and that the level of dominance exercised by a teacher during the consultative process influenced teachers’ acceptability of the intervention. These results indicate ramifications for treatment effectiveness. As such, results suggest that teacher influence may be positively or negatively associated with outcomes. These mixed findings reflect the need for additional research investigating the complex role of teachers’ influence in the consultative process.

Another teacher factor that emerged as a potential barrier among consultative interventions was teachers’ knowledge of ADHD before training, and their beliefs – specifically, their locus of control, or their responsibility for student academic outcomes (Owens et al., 2017). It has long been hypothesized that teachers’ locus of control may be important for determining behavioral attributions of teachers in order to intervene and train teachers on appropriate classroom management (Rose & Medway, 1981). In addition, teacher engagement in the consultative process had an association with consultative outcomes, as demonstrated by Power and colleagues (2009), where the Teacher Investment Questionnaire was used to assess teacher engagement with the intervention. This aligns with previous literature suggesting that participant engagement is a critical component of intervention quality (Power et al., 1995).

There have been a considerable number of studies investigating teacher training to improve knowledge about ADHD (e.g., Aguiar et al., 2014; Corkum et al., 2019; Freeman et al., 2014). The intervention studies included in this review identified several teacher-level factors including teachers' level of knowledge about ADHD, attitudes, confidence, and teachers' perceptions about their ability to carry out an intervention as important facilitators for intervention effectiveness (Coles et al., 2015; Zentall & Javorsky, 2007). Results from included studies also evidence that future work should aim to better understand the influence of teacher-level factors including, (a) knowledge of ADHD symptoms, (b) knowledge of evidence based practice for students with ADHD (e.g., behavior and classroom management), (c) teachers' self-efficacy, (d) teachers' locus of control, (e) teachers' perceptions of ADHD, and (d) a teachers' relationship with the student and the student's parents, to elucidate additional mechanisms that contribute to the effectiveness of school-based interventions for students with ADHD.

Discussion

This small-scale, narrative synthesis of the broad ADHD interventions literature explored whether studies evaluating the effectiveness of school-based interventions for students with ADHD also measured teacher factors alongside intervention effectiveness, as recommended by previous literature reviews (e.g., Sherman et al., 2008). Where teacher factors were measured, the intent was to determine which, if any, teacher-level factors had been identified as potential influencers on intervention effectiveness. Despite the considerable number of studies in the past decade that explore ways to improve teachers' knowledge of ADHD and improve school-based interventions for students with

ADHD, our systematic search identified only nine articles that met this review's inclusion criteria. These nine studies all yielded valuable insights that support greater understanding of the relationships between teacher factors and school-based interventions for students with ADHD. However, it is abundantly clear that further work needs to be conducted to increase researchers' understanding of the complex relationships between teacher factors and the outcomes of school-based interventions for students with ADHD.

The categories of teacher factors that emerged from the included studies were teachers' ADHD knowledge and behavior intervention skills, teacher interpersonal factors, and intrapersonal factors. The dependent measures that were categorized as teachers' knowledge of ADHD and related intervention skills include knowledge of ADHD, knowledge and appropriate exercise of behavioral principles, classroom management skills, treatment integrity, acceptability of the treatment, and level of engagement in treatment. The dependent measures in the teacher interpersonal skills category included the teacher-student relationship and the parent-teacher relationship. The third category, intrapersonal factors, included teachers' confidence in working with students with ADHD and carrying out an intervention, locus of control, and attitudes concerning ADHD. All the included studies either implemented a consultative intervention or a multi-component professional development training aimed at improving teachers' skills in working with students who have ADHD.

Consultative and teacher training interventions require direct involvement by the teacher; thus, it is crucial to evaluate teacher outcomes. However, many studies neglect measurement of teacher-level variables concurrently with intervention effectiveness. Of

the studies included in this review, an array of teacher variables was assessed, including knowledge, self-efficacy, classroom management skills and response to problem behavior, relational improvements, dominance (successful influence) and domineeringness (attempts to influence the consultant), and years of teaching experience. Several studies indicate that (a) knowledge of ADHD and (b) confidence in implementing behavioral interventions for students with behavioral difficulties may increase after the conclusion of teacher training or professional development (Coles et al., 2015; Owens et al., 2017; Zentall & Javorsky, 2007). Interestingly, Owens and colleagues (2017) also found that teachers with a low baseline level of knowledge experienced greater gains, suggesting that teacher training may be more effective for teachers who may be newer teachers or those with less experience. This study also found improvements in teacher classroom management skills and response to student problem behavior. Furthermore, Owens and colleagues (2018) found an association between teachers' appropriate response to problem behavior and lower rates of problem behavior overall in the classroom, demonstrating the importance of classroom management. Regarding relational outcomes, the picture is mixed: one study found improvements in the parent-teacher relationship (Power et al., 2009); another study did not find differences in the student-teacher relationship (Fabiano et al., 2010). Finally, Veenman and colleagues (2018) determined that years of teaching experience and class size were not associated with intervention effectiveness.

In terms of student factors, research indicates that students with ADHD have higher risk of experiencing negative academic and social outcomes, including academic

underachievement, failing grades, grade retention, suspensions, expulsions, school dropout, and peer rejection (Barkley et al., 1990; Barkley, 2014; DuPaul et al., 2016; McQuade & Hoza, 2015). Given these grave outcomes, it is important to identify and evaluate effective interventions for this population of students. Furthermore, it is essential that studies continue to measure meaningful student outcomes. The majority of studies included in this review evaluated classroom behavior, problem behavior, or ADHD symptomatology. Zentall and Javorsky (2007) found that teacher training was associated with improvements in teacher ratings of their students' social skills. Adding to this, Veenman and colleagues (2018) concluded that the intervention was more effective for participants who, at baseline, were less accepted by their peers. One study found that student off-task behavior decreased as a result of teacher participation in classroom management training (Coles et al., 2015), whereas another study found that classroom management (i.e., using effective commands and praise) did not have an impact on student behavior (Owens et al., 2018). While Veenman and colleagues (2018) found that changes in ADHD symptomatology were more likely to occur in older students from highly educated families, Power et al., (2009) found minimal changes in ADHD symptom severity when comparing a sample of second (ages 6-7) to sixth grade (ages 11-12) students. Three studies emphasized measurement of students' progress towards their behavioral and/or IEP goals. Of these, results from two studies suggested that teacher consultation (Erchul et al., 2007) and use of a DRC (Fabiano et al., 2010) could be positively associated with student progress toward goals.

Limitations

Since the authors' goal was to identify peer-reviewed studies, this review excluded unpublished manuscripts and articles that were not peer-reviewed. It is recommended that future research should aim to capture all relevant articles, providing additional comprehensive reviews regarding teacher factors, and calculating effect sizes where relevant. However, the purpose of the present review was to continue the work of previous researchers by demonstrating that the significant gap in school-based ADHD intervention research remains to be addressed and to encourage further work in this important and so far overlooked area of study. Given the nascent research in this field thus far, and the small subset of articles included in this review, the data and findings presented in this review should be interpreted with caution.

Conclusion

Teachers are vital resources for the implementation of school-based interventions designed for students with ADHD. The nine studies discussed in this review provide a rich contribution to addressing the connections between teacher factors and student intervention outcomes. However, consistent with previous recommendations provided by several researchers (e.g., Greene, 1995; Sherman et al., 2008; Hinshaw, 2007; Gaastra et al., 2016; Kos et al., 2006) the results of this review suggests that the complex question of whether teacher-level factors influence an intervention's effectiveness requires further research. Exploration of these teacher-level factors represents an essential step forward for ADHD intervention research to progress. Future research must explore teacher level factors as possible explanatory variables for the effectiveness of an intervention, which may be crucial information for improving interventions.

Teachers experience significant stress in managing their classrooms, and without appropriate support, the problematic behaviors associated with ADHD may amplify that stress. With a better understanding of the teacher factors that may be influencing a given intervention's effectiveness, teachers and researchers alike may be able to use that valuable information to inform more effective interventions. Such knowledge may ultimately support teachers and students alike, by helping to improve problematic ADHD-related behaviors, as well as fostering greater gains in student outcomes.

Note. All search results and data from included articles are detailed on the project's Open Science Framework page (https://osf.io/bs5km/?view_only=d242de25b7c64b3b843cffb4ebea3ddd).

Figure 1.

Flow chart summarizing findings of search results.

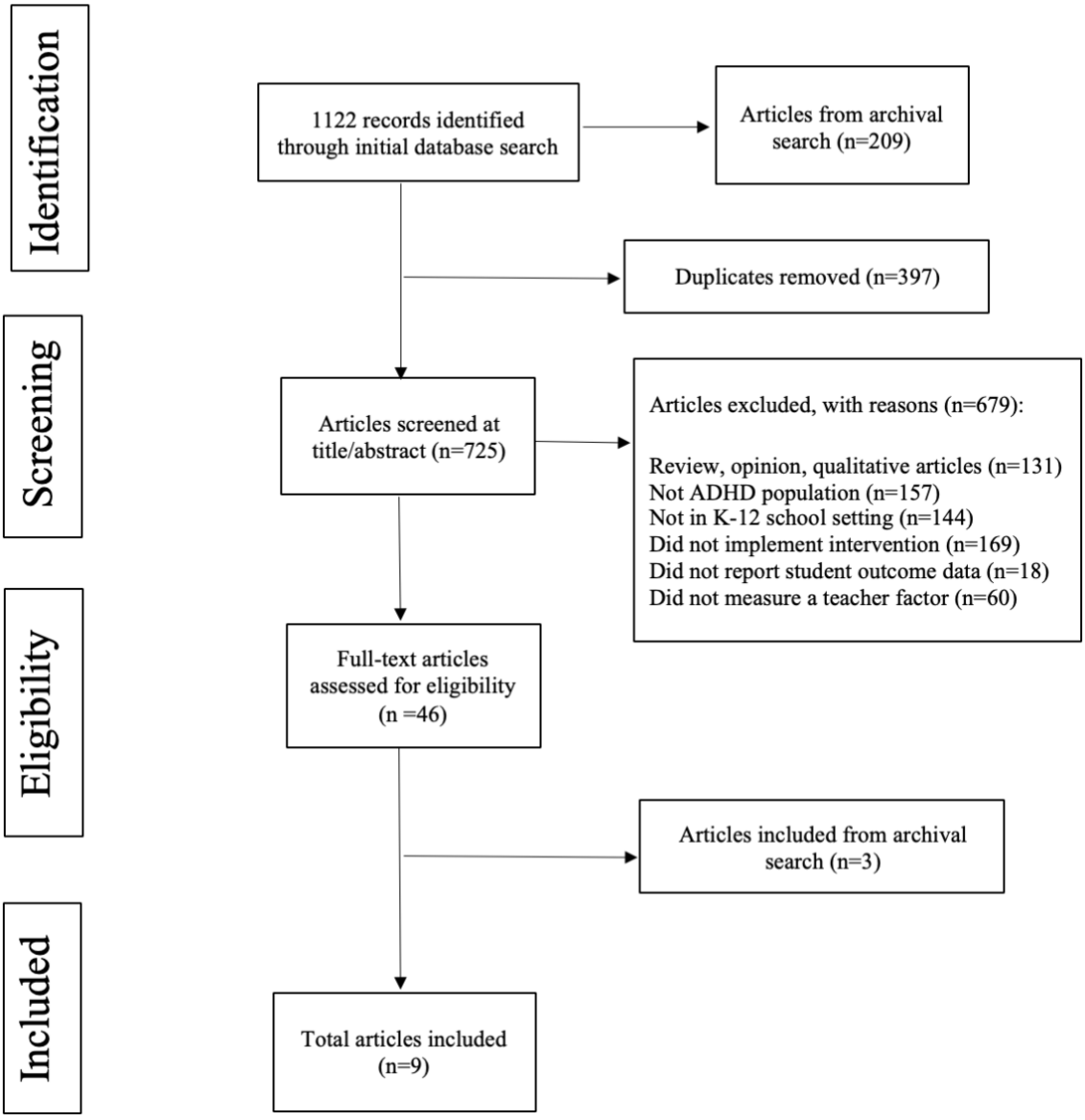

Table 1.

Summary of included articles

	Participants	Intervention	Outcome measure(s)	Duration
Coles et al., (2015)	2 elementary teachers, 2 students with ADHD	Teacher training and consultation	**Teacher:** Knowledge of ADHD Self-efficacy **Student:** Problem behavior Academic performance	Eight biweekly sessions
Erchul et al., (2007)	42 elementary teachers, 42 students with ADHD symptoms	IAI consultation model, PII	**Teacher:** Domineeringness Dominance Treatment integrity **Student:** Behavior change Progress toward target behavior	One PII session
Erchul et al., (2009)	20 elementary teachers, 20 students with ADHD	IDAI behavioral consultation model; PAI	**Teacher:** Domineeringness Dominance Treatment integrity Treatment acceptability **Student:** Progress toward target behavior	One PAI session
Fabiano et al., (2010)	63 elementary students with ADHD	Daily Report Card (DRC) and consultation	**Teacher:** Student-teacher relationship **Student:** Rule violations Academic performance ADHD, ODD, and CD symptoms Impairment Progress toward IEP goals	Eight months

Owens, et al., (2017)	58 elementary teachers, 58 students with ADHD or at-risk for ADHD	Multi component consultation intervention vs. Traditional Consultation	**Teacher:** Knowledge of behavioral principles Knowledge of ADHD Locus of control Classroom management skills **Student:** Rule violations	Six biweekly sessions
Owens et al., (2018)	55 elementary teachers, 55 students with ADHD	Consultation	**Teacher:** Response to problem behavior **Student:** Problem behavior	--
Power et al., (2009)	45 families and teachers in FSS, 48 families and teachers in CARE	Multicomponent behavioral intervention versus BPT	**Teacher:** Engagement in intervention Support for homework Parent-teacher relationship **Student:** ADHD symptom severity School/family adversity	Twelve weekly sessions
Veenman et al., (2018)	Teacher demographics not provided, 114 elementary students with ADHD symptoms	Teacher training	**Teacher:** Years of teaching experience **Student:** ADHD symptoms Behavior problems Social skills	Eighteen weeks
Zentall & Javorsky (2007)	49 teachers, 196 students with ADHD	Teacher professional development	**Teacher:** Self-efficacy **Student:** ADHD symptoms Classroom behavior	1-2 sessions

Rationale for Study 2

There are approximately two students with ADHD in every classroom (CDC, 2022). Despite the high number of students with ADHD educators will undoubtedly serve, teachers frequently report they feel inadequately prepared to teach students with ADHD (Ward et al., 2022). Given the lack of pre-service training teachers receive, it is not surprising that teachers report a lack of confidence in supporting students with ADHD (Capizzi, 2018). Teachers' reported lack of confidence in their ability to educate students with ADHD, compounded by the manifestation of students' symptoms of ADHD in the classroom (e.g., distractibility, interrupting conversations, fidgeting), make students with ADHD more stressful to teach (DeSchazer et al., 2023). Taken together, improving teachers' knowledge of ADHD (e.g., diagnosis, assessment, intervention) through training may be a promising intervention for reducing teacher stress and improving teachers' self-efficacy. Study 1 investigated the teacher level factors that were measured in prior research to better understand whether the characteristics of the teachers delivering interventions influence students' post-intervention outcomes. Results of Study 1 evidence that teachers' knowledge of ADHD and confidence in implementing behavioral interventions are salient influencers for the implementation of school-based interventions for students with ADHD. With emerging evidence that teachers' knowledge of ADHD affects student and teacher outcomes, researchers have a responsibility to design effective and timely interventions to improve teacher knowledge of ADHD. Study 2 aims to examine the effectiveness of a virtual, self-paced teacher training designed to

increase pre-service teacher knowledge about ADHD and improve pre-service teachers' self-efficacy in their ability to educate students with ADHD.

Study 2: Using a Brief Web-Based, On Demand Training to Improve Preservice Knowledge of Attention Deficit Hyperactivity Disorder

Abstract

Teachers play an essential role in supporting children with ADHD and are often responsible for implementing the classroom-based interventions designed to bolster the academic and behavioral success, and the socio-emotional development of children with ADHD in schools. Unfortunately, several studies suggest teachers are inadequately prepared to shoulder this role. Evidence suggests there are widespread gaps in teacher knowledge about the meaning of a diagnosis of ADHD and evidence-based interventions used to support children with ADHD in schools. The purpose of this study is to examine the effectiveness of a virtual, self-paced professional development seminar for pre-service teachers. The webinar will be aimed at improving pre-service teacher knowledge about the diagnosis of ADHD, characteristics of students with ADHD in the classroom, and evidence-based interventions that can be used to alleviate academic and behavioral problems often experienced by students with ADHD. The webinar also aims to increase pre-service teachers' self-efficacy as it relates to supporting children with ADHD.

Note. Monteiro, E. M.*, & Sims, W. (2023). Using a brief web-based, on demand training to improve preservice knowledge of attention deficit hyperactivity disorder. *Psychology in the Schools*, pits.22915. https://doi.org/10.1002/pits.22915

*lead and corresponding author

Attention-Deficit Hyperactivity Disorder (ADHD) remains one of the most common neurobehavioral disorders in children, affecting approximately 4% to 12% of school-age children worldwide (Polanczyk et al., 2007). According to Diagnostic and Statistical Manual, Fifth Edition (DSM-5; American Psychological Association, 2013), ADHD is a neurodevelopmental disorder characterized by pervasive and impairing symptoms of inattention, hyperactivity, and/or impulsivity that impairs functioning in at least two settings (e.g., home, school). ADHD significantly impacts an individuals' behavioral, social, and academic functioning (Klinger, 2002). Children and adolescents with the disorder frequently experience educational difficulties (Loe & Feldman, 2007), problems with self-esteem (Bussing et al., 2000), impaired family and peer relationships (Hoza, 2007), and an overall lower quality of life (Coghill, 2010). ADHD-related impairments persist across the lifespan and may underlie subsequent problems in adulthood such as occupational difficulties, criminal activity, substance abuse problems, and traffic accidents and citations (Hodgkins et al., 2012).

Difficulties Experienced by Students with ADHD

The majority of students with ADHD exhibit difficulties in academic performance (Birchwood & Daley, 2012) and difficulties with academic engagement (Vile Junod et al., 2006) in the classroom. High rates of comorbidity also compound the challenges experienced by students with ADHD. For example, nearly 70% of students with ADHD also have a learning disorder (Mayes & Calhoun, 2006). Academic challenges can be exacerbated by symptoms of ADHD, including inattention, disorganization, and tendency to engage in off task behaviors (Langberg et al., 2011a). Students with ADHD are more

likely to have poorer grades, be identified for special education (Loe & Feldman, 2007), and are at higher risk for being retained and for dropping out of high school (Barbaresi et al., 2007; Galéra et al., 2009). Additionally, several students with ADHD experience behavioral problems, including aggression and noncompliance (Barkley, 2006), as well as social impairment, characterized by difficulty interacting with peers and adults. Given these compounded difficulties, it is imperative that schools effectively support the academic, behavioral, and socioemotional development of students with ADHD.

Supporting Students with ADHD

Several interventions exist to support the academic and behavioral success of students with ADHD. A meta-analysis conducted by DuPaul and colleagues (2012) suggests that overall, school-based interventions for students with ADHD have a significant and positive effect on students' academic and behavioral outcomes. In this study, academic interventions focused on manipulating antecedent conditions like academic instruction or academic materials. Contingency management interventions used reinforcement in the form of praise or punishment in the form of corrective feedback to shape desired behaviors. Cognitive behavioral interventions focused on developing students' self-control skills and reflective problem-solving strategies. Results revealed that a dual approach that applies academic and contingency management interventions yielded the greatest effects on student outcomes. Effect sizes for cognitive behavioral interventions were smaller relative to both categories of interventions. Another key finding that emerged from this study was that interventions implemented in general education classrooms yielded similar effects for both academic and behavioral outcomes

relative to strategies used in special education (DuPaul et al., 2012). This is notable given that students with ADHD are frequently placed in general education classrooms and receive "push in" services (Turnbull et al., 2004).

There are two primary mechanisms through which educational supports are provided to students with ADHD: Section 504 of the Rehabilitation Act of 1973 and Individuals with Disabilities Education Improvement Act (IDEA, 2004). In one study researchers found that just over half of the students with a diagnosis of ADHD had an IEP or 504 plan (Murray et al., 2014). Unfortunately, despite calls for use of evidence-based interventions for students with ADHD in schools (DuPaul et al., 2012; Gaastra et al., 2016), evidence suggests that at least one in five students experiencing significant academic and social difficulties with ADHD do not receive evidence-based support services (DuPaul et al., 2018). Taken together, the opportunity to improve identification of students with ADHD and delivery of evidence-based support services is likely to improve students' educational trajectories. Such activities depend almost exclusively on the adults that surround students with ADHD, illustrating the importance of well-trained, well-supported teachers and support staff in recognizing and managing symptomology or behavioral correlates associated with ADHD.

Difficulties Experienced by Teachers

Given the large number of students with ADHD and the interventions recommended to support students with ADHD, teachers play an essential role in guiding the identification and support processes for these students. Teachers are often tasked with referring students who are at-risk of falling behind, in addition to implementing

interventions to support previously identified students' success (Topkin et al., 2015). In the classroom, teachers are frequently charged with implementation and progress monitoring of interventions. Unfortunately, current evidence suggests that teachers may be inadequately prepared to support students with ADHD effectively due to limited pre-service training (Martinussen et al., 2011). Teachers must have both knowledge of the child and knowledge of ADHD to appropriately select an effective intervention for their student. Additionally, teaching experience and teachers' personality may serve as factors that influence the effectiveness of classroom interventions for children with ADHD (Gaastra et al., 2016). Given these factors and the symptoms exhibited by students with ADHD, teachers frequently report that students with ADHD are stressful to teach (Greene et al., 2002).

This stress is likely compounded by difficulties related to inadequate training regarding how best to support students with ADHD in the classroom. Several studies have revealed gaps in teacher knowledge and perceptions about the diagnosis of ADHD (Gaastra et al., 2016) and about evidence based interventions used to support children with ADHD (Lawrence et al., 2017). Recent studies identified the presence of gaps in teacher knowledge of ADHD symptoms (Guerra et al., 2017; Sciutto et al., 2016), as well as insufficient knowledge about evidence-based interventions that can be used to support students with ADHD (Lawrence et al., 2017).

Many studies using the Knowledge of Attention Deficit Disorder Scale (KADDS; Sciutto et al., 2000) to measure teacher knowledge about ADHD have found lower levels of ADHD knowledge among teachers, ranging between 15% and 62% correct (Alkahtani,

2013; Anderson et al., 2012; Bradshaw & Kamal, 2013; Guerra & Brown, 2012; Perold et al., 2010; Sciutto et al., 2016; Topkin et al., 2015; Youssef et al., 2015). The low levels of knowledge described are not surprising given teacher reported deficiencies in their training on ADHD related topics (Jones & Chronis-Tuscano, 2008; Martinussen et al., 2011). Lack of knowledge related to ADHD diagnostic symptoms, associated features, and treatment has long been identified as a key impediment to teachers' support for students with ADHD (Shapiro & DuPaul, 1993). This is especially disappointing considering the strong evidence base supporting the efficacy of school-based interventions for students with ADHD.

Another facet of ADHD knowledge as measured by the KADDS is 'misconceptions' about ADHD. Misconceptions are likely developed by colloquial discussions about ADHD and the publicization of ADHD in popular media (Mueller et al., 2012). Evidence suggests that teachers are not immune to adopting these misconceptions, even when the teacher has some accurate knowledge of ADHD (Arcia et al., 2000). For example, a commonly held misconception identified by teachers is that ADHD symptoms are caused by poor diet or poor parenting (Barbaresi & Olsen, 1998). The adoption of misconceptions by teachers is a widespread finding across countries (Aguiar et al., 2014; Stampoltzis & Antonopoulou, 2013). These misconceptions combined with feelings of under preparedness to support the unique challenges faced by students with ADHD can have disastrous effects on teachers' efforts to support students with ADHD.

Teachers' Self-Efficacy

An important indicator of teachers' training and eventual practice is teacher self-efficacy. Teacher self-efficacy is defined as a teacher's beliefs in their capabilities to organize and implement strategies that bring about desired outcomes of student engagement and learning (Bandura, 1977; Tschannen et al., 2001). Teachers' sense of self-efficacy is related to numerous variables that might impact the uptake of knowledge when trained on new tasks and the application of knowledge gained, including professional goals and resources available to dedicate to mastery of a given task (Fives & Gill, 2015; Morris et al., 2017). Teachers with a strong sense of self-efficacy will utilize more effective teaching and classroom management strategies and are more committed to their profession (Woolfolk et al., 2006; Zee & Kooman, 2016). Importantly, teachers' self-efficacy has been found to be strongly associated with evaluations of their effectiveness by fellow teachers and administrators and has been associated with improved student achievement (Klassen and Tze, 2014; Zee & Kooman, 2016).

Pre-service teachers tend to report higher levels of teaching self-efficacy at the end of their formal training, compared to their reported levels of teaching self-efficacy when beginning their program (Gordon & Debus, 2002; Lin et al., 2002; Woolfolk et al., 2005). Examining perceptions of self-efficacy in pre-service teachers, both generally and within more specific teaching tasks, such as engaging students and managing the classroom, during teacher preparation is important because pre-service teachers' self-efficacy beliefs are malleable early on in learning (Bandura, 1977). Previous literature suggests that teachers with higher self-efficacy are more willing to implement new

methods to respond to students' diverse needs (Berman et al., 1977) and are more likely to refer a student with difficulties for additional assistance (Podell & Soodak, 1993). Teachers with low self-efficacy tend to report more classroom disturbances and higher levels of emotional exhaustion (Dicke et al., 2014) which may, in part, be due to teachers' limited preparedness and thus their self-efficacy for supporting students with ADHD in the classroom.

The Teacher Self-Efficacy Scale (TSES; Tschannen-Moran & Woolfolk Hoy, 2001) is an instrument that is often used to measure the teaching self-efficacy of pre-service teachers (Fives & Buehl, 2010; Knoblauch & Woolfolk Hoy, 2008). Legato (2011) found that ADHD knowledge and self-efficacy were positively correlated with each other, where increased ADHD knowledge was associated with higher self-efficacy. Few studies have measured teacher self-efficacy alongside an intervention to improve teachers' knowledge about ADHD. This is a glaring problem given that self-efficacy is salient for predicting whether a teacher will implement the strategies they learned about in the ADHD professional development training.

Latouche and Gascoigne (2019) were the first, and only research group thus far, to evaluate the impact of an ADHD training intervention on teachers' self-efficacy. The study found that a brief in-service workshop increased primary school teachers' ADHD knowledge and sense of self-efficacy immediately following the training. Further, both ADHD knowledge and teachers' ratings of self-efficacy remained higher at the 1-month follow-up compared to pre-intervention ADHD knowledge. To bolster understanding of the effects of pre-service teacher training on perceived self-efficacy in supporting

students with ADHD, this study will use the TSES to measure pre-service teacher self-efficacy before and after a brief training.

ADHD Focused Training

At the core of teacher efficacy is the depth and breadth of teachers' professional preparation. The majority of teachers report that they did not have ADHD related coursework in their undergraduate or graduate training (David, 2013; Guerra et al., 2012). Teachers consistently report they do not receive the necessary training to effectively manage students exhibiting problematic behavior in classrooms (Christofferson & Sullivan, 2015). There is a well-documented need for the development of effective pre- and in- service training programs to increase teachers' competence about ADHD (Guerra et al., 2017). Previous research surveying teachers' ADHD knowledge suggests that teachers lack knowledge about the symptoms of ADHD, educational interventions for students with ADHD, and the challenging outcomes students with ADHD experience (Guerra & Brown, 2012; Guerra et al., 2017). It has been argued that teachers who have an improved understanding of students with ADHD may feel more empowered to support them (Holz & Lessing, 2002) and may be more likely to implement necessary classroom interventions with improved adherence and fidelity (Shah et al., 2016). Importantly, previous literature suggests teachers who receive minimal training as pre-service teachers tend to have negative attitudes towards students with disabilities (Rubie-Davies et al., 2012; Tiwari et al., 2015). Considering the potentially harmful effects of deficiencies in knowledge and misconceptions held by teachers, improving preparation in this area appears highly advantageous. To date, studies that have evaluated training activities

aimed at increasing teachers' ADHD knowledge are few in number and small in effect. Jones and Chronis-Tuscano (2008) found a very small increase in teachers' ADHD knowledge, although high pre-intervention knowledge levels may have contributed to this modest result. Other similar studies have revealed a modest increase in ADHD knowledge following a teacher-focused training (Aguiar et al., 2014; Syed & Hussein, 2009).

Ultimately, increasing teachers' knowledge about ADHD will better equip teachers to identify and effectively support students with ADHD in their classrooms. Training may also help teachers develop feelings of competence, a potential proxy for self-efficacy, and foster a sense of conviction for the effectiveness of their actions (Latouche & Gascoigne, 2019). One potential remedy for the lack of ADHD teacher trainings is the use of web-based, easily consumable professional development modules (Corkum et al., 2019). Given the rise in technology use and information dissemination via the internet, the use of webinars to increase pre- and in-service teacher knowledge of ADHD symptoms, diagnosis, and treatment in schools is advantageous and timely.

Purpose

This study evaluated the impact of a brief virtual webinar covering ADHD diagnostic criteria, assessment of ADHD symptoms, and the variety of effective school-based interventions available for students with ADHD on pre-service teacher knowledge about these topics. Study objectives included: (a) to measure the baseline ADHD knowledge and teaching self-efficacy of a sample of pre-service teachers, (b) to evaluate the effectiveness of the ADHD training webinar by measuring pre-service teachers'

ADHD knowledge and self-efficacy directly after the delivery of the webinar, and (c) to assess social validity of the training.

Research Hypotheses

1. Pre-service teacher knowledge of ADHD symptomology, diagnostic processes and procedures, and evidence-based intervention practices will increase following participation in the ADHD webinar. Significant improvements are anticipated in pre-service teacher KADDS scores following completion of a 2-hour ADHD webinar.
2. Pre-service teacher misconceptions of ADHD will improve following participation in the ADHD webinar. Significant improvements are anticipated in pre-service teacher KADDS scores following completion of a 2-hour ADHD webinar.
3. This brief webinar on ADHD will increase pre-service teachers' self-efficacy in educating students with ADHD. Improvements are anticipated in pre-service teachers' TSES scores following completion of a 2-hour ADHD webinar.
4. Pre-service teachers will perceive the ADHD webinar as socially valid. Participants' ratings of the usability, feasibility, and acceptability of the ADHD webinar will be evidenced by favorable ratings on the User Rating Profile-Web Resource (URP-WR; Mandracchia & Sims, 2020).

Methods

Participants

Approval of all study activities was acquired from the University of California Riverside Institutional Review Board. This study recruited pre-service teachers at the University of California-Riverside. Study eligibility was based on potential participants status as a "pre-service teacher." Pre-service teachers were defined as undergraduate

students accepted into the teacher credentialing program. Eligible participants were provided with extra credit from their respective instructors for participating in this research study. Ultimately, data from 71 participants were used in analyses.

The majority of participants were female (90%) and Hispanic/Latina (48%). Most pre-service teachers in this sample reported that they intend to continue their careers in the general education setting (85%). Regarding previous experience with and exposure to ADHD, 23% of the participants reported having some experience working with children who had been diagnosed with ADHD (i.e., 1-2 students, 18%; 3-4 students, 1%; more than 5 students, 4%). Additionally, 42% of participants reported taking a course where they learned about the diagnosis itself, the difficulties students with ADHD face, or educational interventions used to support students with ADHD (i.e., 1-2 courses, 36%; 3-4 courses, 6%). Demographic information for this sample of pre-service teachers is presented in Table 2.

Measures

Demographic Information

Demographic Questionnaire. Preservice teachers completed a 10-item, study specific questionnaire containing items that asked about participants' sex, age, completion of university studies that covered information about ADHD, exposure to information about ADHD in the last 12 months, and primary versus secondary teacher status. Teachers were also asked what grade(s) they intend to teach, what subjects they intend to teach, and whether they intend to teach in a general education or a special education setting. With regard to ADHD, participants were asked whether they received

any coursework on ADHD and education-related subject matters and whether they ever worked with a child who they knew was diagnosed with ADHD.

ADHD Knowledge

Knowledge of Attention Deficit Disorders Scale. The KADDS (Sciutto et al., 2000) is a 36-item rating scale designed to assess knowledge of ADHD. Each KADDS item prompts the respondent with a statement about ADHD and respondents use a true (T), false (F), or don't know (DK) format to answer each item. This format allows for differentiation of what teachers *do not know* from what they believe incorrectly (i.e., misconception). The KADDS measures knowledge and misconceptions of ADHD in three specific areas: *Symptoms/ Diagnosis* of ADHD, *Treatment* of ADHD, and *Associated Features* (i.e., general information) including the nature, causes, and outcomes of ADHD. These subscales were chosen by Sciutto and colleagues (2000) to reflect content areas relevant to educational professionals. For the purposes of the present study, the first author computed two separate scores: *Misconceptions* (i.e., total number of incorrect answers) and *Knowledge* (i.e., total number of correct answers). For example, if a preservice teacher answered 15 items correctly, 10 incorrectly, and chose "*Don't Know"* for 11 items, their knowledge score would be 15 and their misconceptions score would be 10. "*Don't Know*" responses are scored separately from the knowledge and misconception scores, "*Don't Know*" responses are not scored as correct or incorrect.

In previous studies with U.S. samples, internal consistency of the KADDS total score has ranged from .82 to .89 (Sciutto et al., 2004). Subscale reliability is more variable and tends to be lower ($.52 < \alpha < .75$). Two-week test-retest correlations for the

KADDS total and subscale scores are moderate to high (.59 < r < .76; Sciutto & Terjesen, 2006). With regard to validity, prior research with U.S. samples suggests that the KADDS scores are sensitive to educational interventions (see Sciutto & Terjesen, 2006) and are positively related to the extent of prior experience with ADHD students (see Sciutto et al., 2004), confidence in recognizing ADHD (see Herbert et al., 2004), and the amount of exposure to research or courses on ADHD (Sciutto et al., 2004). In previous studies assessing individuals' knowledge of ADHD, higher KADDS scores have been associated with greater prior exposure to children with ADHD, general level of training (i.e., in-service vs. preservice), and greater exposure to information about ADHD (Perold et al., 2010). In the present study, internal consistency of the KADDS was .96 for the pre-intervention survey and .84 for the post-intervention survey.

Teacher Self-Efficacy

Teacher Self-Efficacy Scale. The TSES (Tschannen-Moran & Woolfolk Hoy, 2001) is a standardized assessment used to measure teachers' self-efficacy regarding working with students with ADHD pre- and post- training. This study used the long form of the TSES, as recommended by the developers of the TSES when working with pre-service teachers, as a buffer against overlapping factor structure when studying preservice teachers (see Fives & Buehl, 2009). The long form of the TSES includes 24 items. Previous factor analyses using pre-service teacher samples have concluded that a 1-factor model resulted in a better fit compared to a three factor model used with in-service teachers (Duffin et al., 2012). Therefore, a unitary construct of self-efficacy is more appropriate for pre-service teachers who might lack the experience necessary to

distinguish between the many tasks involved in teaching. While the items themselves were not altered, participants were prompted to respond with students with ADHD in mind. Participants responded on a 9-point continuum ranging from nothing (1) to a great deal (9). To determine overall teaching self-efficacy, participants' ratings for each item were averaged to create a unitary construct of teaching self-efficacy.

The TSES has high internal consistency (Cronbach's α is .92; Page et al., 2014). Validity of the TSES has been investigated across a variety of teacher samples, including factor analyses that examined responses from samples of teachers across countries (Klassen et al., 2009; Moulding et al., 2014; Tschannen-Moran & Woolfolk Hoy, 2001). Klassen and colleagues (2009) describe strong model fit, with RMSEA score of 0.053, $p<.05$ for the North American teacher group, and strong measurement invariance across teachers from elementary, middle, and high school working in North America. Factor analyses developed from surveying pre-service teachers have also been examined and results indicated a one-factor solution accounted for 64.5% of the variance in scores. Moulding and colleagues (2014) found that item loadings for this factor ranged from .657 to .879. In the present study, internal consistency of the TSES was .98 for the pre-intervention survey and .98 for the post-intervention survey.

Social Validity

Usage Ratings Profile- Web Resource. The URP-WR (Mandracchia & Sims, 2020) was used to measure the usability, feasibility, and acceptability of the web-based teacher training. URP-WR was developed from the URP-Intervention (URP-IR) rating scale (Briesch, et al., 2013) with the aim to evaluate the web-based resources intended for

teacher education and professional development. Factor analyses during initial validation procedures found that URP-WR was comprised of 4 factors: *Acceptability*, *Reasonability* (i.e., feasibility and credibility), *Appearance*, and *Systems Support.* Items from one factor, *Accessibility*, were not used for this study because participants were not independently searching for the training (Mandracchia & Sims, 2020). Consequently, the measure in this study consisted of 27 questions in which participants responded on a 7-point Likert scale ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Scores on the URP-WR were computed by calculating a mean score for each of the three included factors in this study. Cronbach's alpha was calculated to determine internal consistency of the URP-WR and a value of .92 emerged. This indicates that the URP-WR has high internal consistency for the present sample.

Procedures

ADHD Webinar Development

Development of this ADHD webinar was guided by findings from current literature and diagnostic criteria (e.g., DSM-5), all of which were cited in each of the lecture videos. This information was corroborated with evidence from the KADDS manual, which includes related citations for each item. This webinar was designed to be a brief, single-session training delivered via video. The webinar was accessed through a secure video hosting platform. A school psychology doctoral student delivered the intervention via web-accessible video recordings so participants could access the web-based training asynchronously. The intervention was developed to educate preservice teachers on aspects of ADHD, specifically (a) the symptoms and contextual components

necessary to diagnose ADHD, (b) the assessment procedures used to verify a diagnosis of ADHD, and (c) the evidence-based behavioral, cognitive, and educational interventions best used to support students with ADHD. The total length of the web-based intervention was 1.2 hours; however, participants could pause to take breaks and complete the training at their own pace. The training format included 3 webinars on ADHD: the first webinar focused on the symptoms of ADHD, the subsequent webinar focused on assessment of ADHD-related impairment, and the third webinar focused on evidence-based classroom intervention supports effective for students with ADHD. The training videos included several examples of vignettes that challenge common misconceptions about the disorder. The distribution of contents followed this schedule:

a. Application of the pre-training survey (i.e., KADDS & TSES)—20 minutes
b. Lecture on ADHD Diagnostic Criteria (according to DSM-5; American Psychological Association, 2013), ADHD symptoms presentation at school, and etiology, including presentations of school-based vignettes —30 minutes
c. Lecture on standardized assessments used to identify ADHD—20 minutes
d. Lecture on available evidence-based behavioral, cognitive, and academic interventions—30 minutes
e. Application of the post-training survey (i.e., KADDS & TSES), URP-WR, and demographics questionnaire—20 minutes

Assessment and Completion of the Training

Preservice teachers were recruited using mass email and course announcements delivered by professors. Some professors also chose to offer extra credit points to

students for completing the training. If pre-service teachers consented to participate in the study (i.e., by signing the virtual consent form delivered via Qualtrics), they were directed to continue to the pre-training survey accessed via Qualtrics. The pre-training survey required participants to answer each item on the KADDS and TSES measures. The last page of the survey provided participants with a link to the webinar delivered via private YouTube videos. Participants were provided a link to a document that included explicit directions to access the numbered webinar videos in order: (1) Diagnosis of ADHD, (2) Assessment of ADHD, and (3) Treatment of ADHD. Following these directions were links to each of the videos provided on the document. To increase ecological validity, the directions on the document informed participants that they may take notes and pause the videos to take breaks as necessary. Once participants completed the ADHD webinar, they were directed to complete the post-training survey on Qualtrics. The post-training survey included the KADDS, TSES, and URP-WR instruments as well as 10 demographic questions.

Analysis

A power analysis indicated that a total sample size of 45 participants would be needed to detect a large effect (d=0.5) with 95% power using a matched pairs study design with α=.05 (Faul et al., 2007). Therefore, this final sample of 71 pre-service teachers is considered a large enough sample size to detect power for the analyses described. Once participants received the intervention and completed the post-training measures, a one-way repeated measure analysis of variance (ANOVA) was performed in

R (R Core Team, 2017) to detect possible increases in ADHD knowledge or self-efficacy from pre-training to post-training.

Pre- and post-training survey scores from the KADDS and TSES were assessed using one-way repeated measures ANOVA within subject factor analyses. All assumptions for the repeated measures ANOVA were met for this data set, therefore, results are valid and can be interpreted with confidence. Unbiased estimates of the effect size (ES) were also computed for the total score from both instruments by calculating η^2 for each ANOVA. Effect sizes were interpreted using Cohen's (1988) guidelines; consistent with these recommendations, values of .02 or less were interpreted as "small", values .13 -.25 were interpreted as "medium", and values .26 and greater were interpreted as "large" effects.

Results

Knowledge of ADHD

A one-way repeated measures ANOVA was conducted to compare the main effect of the training on pre-service teacher knowledge of ADHD. A statistically significant difference was noted between mean pre-training scores (M=14.39, SD=3.89) and mean post-training scores (M = 24.35, SD = 8.03; $F(1, 70) = 121.59$, $p < .001$, $\eta^{2=}.39$; see Table 3 and Table 4). These results provide sufficient evidence to conclude that webinar participation improved pre-service teacher knowledge of ADHD identification and intervention. Furthermore, unbiased estimates of effect size indicated large training effects (d = .39) (Cohen, 1988).

Misconceptions About ADHD

A repeated measures ANOVA was used to evaluate whether the web-based training was effective in refuting pre-service teachers' misconceptions about ADHD. The repeated measures ANOVA revealed a main effect of time, results indicate that the web-based teacher training had a significant effect on pre-service teachers' misconceptions as measured by the KADDS, $F(1, 70) = 69.36$, $p < .001$, $\eta^{2=}.22$ (see Table 3 and Table 4). However, misconception scores changed in unexpected directions, where pre-service teachers' KADDS misconceptions score increased by 4.14 points from pre-training (M= 8.37, SD =3.44). The effect size for this finding was medium (d = .22) (Cohen, 1988).

Self-Efficacy

Results of the analyses assessing pre-service teachers' self-efficacy pre-training versus post-training are depicted in Table 3 and Table 4. For teachers' self-efficacy, the repeated-measures ANOVA also revealed a main effect of time, $F(1, 70) = 21.76$, $p <$ .001, $\eta^2 = 0.05$ where, on average, self-efficacy significantly increased across participating pre-service teachers' following the intervention. Participants' average self-efficacy increased scores from pre-training (M = 6.67, SD = 1.36) to post-training (M = 7.23, SD = 1.20). The effect size for this finding was small (d=.05) (Cohen, 1988).

Social Validity

The final research hypothesis anticipated pre-service teachers would rate this intervention as acceptable, bolstering evidence for the social validity of the training. Participant ratings of the usability, feasibility, and acceptability of this webinar will be evidenced by favorable User Rating Profile-Web Resource (URP-WR; Mandracchia &

Sims, 2020) scores. All participants' ratings on the URP-WR were aggregated across included domains. Participants generally rated the training as acceptable (see Table 3). On average the *Appearance* score was 54.61 out of a possible 60 (*SD* = 10.95), indicating that most participants found the PowerPoint slides and pre-recorded videos visually appealing. On average the score for *Systems Support* was 19.63 out of 24 (*SD* = 5.17), indicating that most participants felt they would need additional support carrying out the recommendations made by this webinar. Finally, the average score for *Reasonability* (i.e., an indicator of credibility and feasibility; see Mandracchia & Sims, 2020) was 71.13 out of 72 (*SD* = 13.16). This *Reasonability* score indicates that most participants believed topics of the webinar were successfully addressed and presented clearly with evidence to substantiate claims, participants would know what to say if they were asked how to implement the recommendations provided by this webinar, and the webinar contained all recommendations needed for implementation of the interventions discussed.

Discussion

The purpose of the current study was to evaluate the effectiveness of a self-paced ADHD teacher training webinar for use with pre-service teachers. Few studies have evaluated the effectiveness of an ADHD training with pre-service teachers and only one study to date has used a web-based format to increase teachers' knowledge about ADHD (see Corkum et al., 2019). The web-based training developed in this study was found to be efficacious in increasing pre-service teachers' ADHD knowledge and teaching self-efficacy when working with students with ADHD. However, unexpectedly, misconceptions about ADHD increased post-training. Finally, pre-service teachers'

ratings of the web-based training were rated high on reasonability and acceptable ratings were reported for appearance and systems support as measured by the URP-WR.

These findings are consistent with prior work. Similar to Aguiar et al., (2014), Corkum et al., (2019), and Latouche & Gascoigne (2019), the brief training delivered in this study resulted in modest improvements in participating teachers' ADHD knowledge. Importantly, effect sizes in the present study aligned with the findings in previous studies, with the exception of Latouche & Gascoigne (2019) whose mean ADHD knowledge gains from pre- to post- training and effect sizes are the highest in the literature so far.

Interestingly, misconceptions increased post-training. There are two possible explanations for the surprising increase in misconceptions following the intervention. First, the increase may be attributable to participants feeling less inclined to respond that they did not know the answer to a question on the KADDS. This would mean that instead of answering "*Don't Know*" participants may have answered incorrectly, resulting in an increase in misconceptions post-training. Support for this hypothesis was found after re-examination of the KADDS scores, such that the number of "Don't Know" responses across all participants decreased from pre-training ($\bar{x}$ = 20.24) to post-training ($\bar{x}$ = 6.2).

Alternatively, it is possible that the present intervention neglected to review information that would correct participants' misconceptions, or that the information presented in the webinar was unclear. This explanation may be plausible given that the relationship between the KADDS score and the extent of prior experience with students with ADHD are positively correlated. The author investigated this possibility by first examining which items were incorrectly answered by more than half of participants.

Twelve items were identified that fell across all three subscales of the KADDS; however, six of the items belonged to the Associated Features subscale. The author then cross-referenced these items with the material presented during the training. Six of the twelve items were covered in the training, these included prevalence, positive illusory bias, medication, and focus of intervention, four items required participants to make a distinction between ADHD and a different neurodevelopmental disability like autism, and the remaining two items, child compliance with father versus mother and characteristics of 'children who come from inadequate or chaotic home environments', were not discussed. Given this information, future work may improve existing or add to related components of the training; for example, it may be useful to directly compare the symptoms of students with ADHD and students with autism so that teachers can distinguish the students in their classrooms.

While results of this study provided evidence of an overall increase in teacher self-efficacy, this increase was small. It is likely that the modest increase in ratings of teacher self-efficacy may be attributable to the lack of practical, real-life experience with ADHD described among participants. The modest increase in ratings of teaching self-efficacy could also be explained by the generally limited experiences of pre-service teachers in their program when participating in this study; participants were recruited in introduction to education classes meaning they are relatively new to the teacher education program. These findings align with previous literature evaluating the use of the TSES for pre-service teachers, which has shown that pre-service teachers newer to their credentialing programs are less likely to rate themselves as effective at teaching and that

these ratings of self-efficacy may be malleable throughout pre-service teachers' early training years (Duffin et al., 2012). Another potential reason for the small gains in self-efficacy is the lack of modeling and opportunities to practice included in this training, given that modeling has been identified as an intervention to boost pre-service teachers' self-efficacy (Zipke et al., 2019). The self-paced nature of the webinar and time and resource limitations (e.g., brief workshop, single facilitator) did not allow for breakout sessions to practice the skills taught. This limitation is not unlike difficulties described by other brief ADHD training programs (Jones & Chronis-Tuscano, 2008; Latouche & Gascoigne, 2019). Finally, the small but significant gains in teaching self-efficacy may be attributable to the dependent measure used. The TSES is a domain general instrument and may not have been well suited for the specialized nature of the intervention (i.e., ADHD focused). Further, as recommended by Fives & Buehl (2009), this study used a unitary construct of teacher self-efficacy to measure pre-service teachers' self-efficacy. The adoption of a unitary construct might limit researchers' ability to detect intervention gains using the TSES. Future studies should pay special attention to the nuances of assessing pre-service teacher self-efficacy using the TSES by, for example, examining the factor structure of the TSES using a pre-service teacher sample or by including more specific questions about pre-service teachers' confidence in working with students with ADHD.

Results regarding the URP-WR indicated that participants found the Appearance of the training videos and PowerPoint appealing. Participants also rated the training as reasonable. High ratings on this factor indicate that participants felt the training program cited appropriate and credible sources, was clearly presented, contained all

recommendations needed for implementation, and they understood and could explain the concepts discussed in the training. The ratings for Systems Support were lower compared to the ratings on the other two subscales of the URP-WR, this subscale comprises items related to the support the pre-service teacher believes they would need from an administrator, co-worker, or other adult. This finding aligns with the current position of these pre-service teachers who are still being trained to carry out the typical skills outlined for teachers and likely do not yet have enough experience to independently carry out the classroom management strategies and other behavioral interventions recommended for use to support students with ADHD.

Implications

This study demonstrated that pre-service teachers' ADHD knowledge and self-efficacy could be significantly improved using a brief, self-paced ADHD webinar. This study has important implications for the future training of pre-service teachers and has the potential to provide an open access, practical solution to address the well-evidenced gap in teachers' knowledge and training (Guerra et al., 2017). While this web-based training is not a substitute for comprehensive training in effective classroom management and individual student behavior management, a brief teacher training may be a pivotal and promising first step in helping teachers to better identify and support the behavior of children with ADHD utilizing the wide variety of effective school-based interventions (Corkum et al., 2019; Jones & Chronis-Tuscano, 2008; Latouche & Gascoigne, 2019).

Limitations

While meritorious, it is important to consider the limitations that exist within the current study. First, this study included voluntary participants which dictated the study design employed. Randomized control trials are the gold standard in assessing causality (Hariton & Locascio, 2018), unfortunately this study was not able to randomize which participants received the intervention due to a combined lack of resources and ethical considerations given that students were offered extra credit for completing the training.

Furthermore, selection of the KADDS as a primary outcome measure should also be acknowledged as a possible limitation in this study given the variable evidence of reliability of the KADDS across differing samples. However, internal consistency for the present sample were found to be well within the acceptable range for both the pre- and post- intervention data collected. It should be mentioned that the value of Cronbach's alpha decreased from pre- to post- intervention, this may be explained by missing data which resulted in exclusion of participants for these calculations. It may also be explained by the change in participants' survey responses due to the effects of the training. The pre-service teachers in this sample are all from the same teacher training program, therefore, their knowledge about ADHD is likely similar and it is possible, expected even, that their ratings on knowledge about ADHD changed post-training. The results of these calculations also reflect a recurring problem with variability of internal consistency of the KADDS (Sciutto et al., 2004).

There are limitations regarding generalizability of these findings due to the participants' demographic characteristics. Namely, participants were recruited from

introductory education courses and were asked to complete the training for extra credit, which may limit the ability to generalize the results of this survey and begs the argument that the pre-service teachers who opted into this study may be more inclined to participate in interventions of this kind. Additionally, participants were incentivized to participate, which could influence response quality. This is to say, participation may have been less related to a desire to grow professionally and more related to pronounced good or pronounced less desirable dispositional attributes. Some participants may be internally driven to excel in professional growth, achievement, or both. These characteristics could predispose participants to improve in response to any training or training format.

The variability in participant timelines may have also confounded results. While participants were given specified times in which to complete activities in absolute, these limits allowed for variability in study completion time. The varying amounts of time participants used to watch the training videos and to complete the post-training survey is an extraneous variable that could not be accounted for in this study given the methods for recruitment. To this point, it may be reasonable to reason that the participants who completed study activities in a timelier manner, particularly the post-KADDS assessment in relation to completing the webinar, may have experienced more pronounced improvements. A strength and potential limitation to the webinar utilized in this study is that the training was self-paced; while this is more generalizable and ultimately more feasible for teachers given their busy schedules, a self-paced training allowed participants to view the pre-recorded videos over varying amounts of time.

Future Directions

The implementation of a randomized control trial to study the effectiveness of this training would allow researchers to control for confounding variables like maturation and timeline for the delivery of the intervention. Future work investigating whether these effects can be replicated with in-service teachers may also be useful for generalization and application in the school setting. Results from an in-service teacher population study might inform administrators' decisions to adopt web-based, self-paced webinars for ADHD as an acceptable form of professional development for teachers. Additionally, it is imperative that researchers follow up on the gains that teachers make in a practical setting well after teachers receive the intervention. One would argue that application of knowledge gained, and adoption of evidence-based practices, is the ultimate goal of the majority of professional development trainings including those that aim to increase teacher knowledge about ADHD. The clinically meaningful implications that these training programs can have on teachers' interactions with students need to be durable and, therefore, need to be examined after a longer period of time has passed (Bradshaw & Kamal, 2013; Greenway & Rees Edwards, 2020). Furthermore, actions should be taken on behalf of schools and teacher preparation programs to increase the accessibility of information about ADHD to pre-service teachers. Future training programs might take preparatory steps like asking pre-service or in-service teachers what they do not yet know and what they believe would be helpful to know about supporting students with ADHD. A consultative approach where teachers attend an initial training and are then paired with a school psychologist who consults with the teacher on a regular basis may be useful for

increasing teacher self-efficacy. Similar consultative work aimed to improve teachers' knowledge, skills, and their beliefs about classroom management may be useful to reference (see Coles et al., 2015).

Table 2

Participant Demographic Information

	n	%
Gender		
Female	64	90
Male	5	7
Gender Variant/ Nonbinary/Nonconforming	2	3
Race & Ethnicity		
Hispanic, Latino, or Spanish origin	34	48
Asian	24	34
White, non-Hispanic	9	13
Black or African American	1	1
Other	3	4
Future Plans		
General Education	60	85
Special Education	11	16
Previous Experience with ADHD		
Worked with diagnosed students	17	23
Exposed through coursework	30	42

Table 3

Results of Repeated Measures Analysis of Variance

Source	Sum of Squares	df	Mean Square	*F*	η2
KADDS Total	3520.06	1	3520.06	121.59***	0.39
Error	2026.44	70	28.95		
Misconceptions	608.7	1	608.7	69.36***	0.22
Error	614.3	70	8.78		
TSES	10.96	1	10.96	21.76***	0.05
Error	35.25	70	.5		

Note. *p<.05, **p<.01, ***p<.001. df=degrees of freedom. KADDS= Knowledge of Attention Deficit Disorder Scale. TSES= Teacher Self-Efficacy Scale.

Table 4

The Effect of Training on Participants' Overall Scores on the ADHD Knowledge, Misconceptions about ADHD, and Average Ratings on the Teacher Self-Efficacy Scale

Instrument	Pre-Intervention	Post-Intervention
KADDS Total Score	14.39	24.35
KADDS Misconception Score	4.23	8.37
Average Ratings on TSES	6.67	7.23

Note. KADDS= Knowledge of Attention Deficit Disorder Scale. TSES= Teacher Self-Efficacy Scale.

Table 5

Ratings on the User Rating Profile-Web Resource

Source	$\bar{x}$	s
Systems Supports	19.63	5.17
Appearance	54.61	10.95
Reasonability	71.13	13.16

III. General Discussion

Discussion

Students with ADHD experience significant challenges in school. The manifestation of symptoms of ADHD in the classroom make it difficult for children to regulate their attention during academic lessons, regulate their bodies to meet classroom behavioral expectations, and regulate their emotions to foster successful relationships with their peers and with school staff (Arnold et al., 2020). Given that many students with ADHD are placed in the general education setting, teachers are frequently tasked with supporting the academic, behavioral, social, and emotional needs of students with ADHD through classroom-based interventions (Evans et al., 2018). However, teachers often report they have not received adequate training to effectively educate students with ADHD. Consequently, teachers frequently report that students with ADHD are more stressful to teach (Fabio et al., 2023; Flanigan & Climie, 2018). To improve the outcomes of students with ADHD and to better support teachers, it is critical for researchers to better understand the variables that promote intervention outcomes (i.e., facilitators) and impede intervention success (i.e., barriers).

Teacher-Level Factors Important for ADHD Interventions

To better understand the potential influence of teachers on school-based ADHD interventions, Study 1 systematically reviewed prior ADHD intervention studies that measured both teacher-level factors and student outcomes. The systematic literature review in Study 1 identified several teacher-level factors that seem to influence student outcomes following school-based ADHD interventions. These findings are consistent with and expand the first literature review, conducted by Sherman and colleagues (2008),

to examine the relationship between teacher-level factors and the intervention outcomes of students with ADHD. Sherman and colleagues (2008) identified several teacher factors that appear to influence student outcomes including teachers' perceptions about ADHD, experience with classroom management, tolerance for challenging behaviors, and acceptability of the intervention. Study 1 of this dissertation identified an additional nine studies that implemented an ADHD intervention that measured teacher-level factors and students' post-intervention outcomes.

Included studies contribute to the literature on the teacher-level factors that influence student outcomes. For example, the multi-component behavioral interventions included in Study 1 identified teachers' knowledge of behavioral principles, knowledge of ADHD, classroom management skills, student-teacher relationships, parent-teacher relationships, and teachers' locus of control as important teacher-level factors (Fabiano et al., 2010; Owens et al., 2017; Power et al., 2009). The findings regarding the importance of teachers' locus of control are consistent with a recent study conducted by Krtek and colleagues (2022) that interviewed teachers to investigate their perceptions of students with ADHD. A thematic analysis of the interviews revealed that some teachers feel a sense of helplessness as a result of the behaviors exhibited by students with ADHD. Interestingly, mixed method results indicated that teachers' beliefs about whether students' disruptive behavior was intentional or unintentional influenced teachers' beliefs in their own ability to intervene on challenging behaviors in the classroom (Krtek et al., 2022). Teachers' beliefs about their ability to organize and implement strategies that bring about desired outcomes of student engagement and learning is defined as a

teachers' self-efficacy (Latouche and Gascoigne, 2019). Similarly, the consultative interventions that were examined in Study 1 identified teachers' knowledge of ADHD, teachers' self-efficacy regarding their ability to support students with ADHD, and teachers' impact on the consultative process (i.e., dominance, domineering) as influencers on consultative effectiveness (Coles et al., 2015; Erchul et al., 2007; Erchul et al., 2008; Owens, et al., 2018). Teachers' self-efficacy was also identified as an important influencer for student outcomes in the teacher training interventions that I reviewed for this study (Zentall and Javorsky, 2007).

Results of Study 1 also highlighted teacher-level factors that did not influence student outcomes. One included study conducted by Veenman and colleagues (2018) provides evidence against a reasonable teacher-level factor—years of experience. This finding is consistent with other recent research that suggests, for both in-service and pre-service teachers, level of experience is not significantly related to the level of knowledge about ADHD (Bolinger et al., 2020; Poznanski et al., 2018). These findings will help to narrow researchers' focus on the teacher-level factors important for student outcomes.

Improving Teacher Knowledge and Self-Efficacy Through Training

It is evident that teachers' knowledge about ADHD and their self-efficacy regarding their ability to educate students with ADHD are important influencers on student outcomes. Thus, Study 2 examined the effectiveness of a brief, self-paced webinar for improving pre-service teacher knowledge about ADHD and increasing pre-service teachers' self-efficacy post-training. Study 1's findings informed the curricula of the teacher training implemented in Study 2, such that information about evidence-based

classroom management and behavioral interventions were incorporated to improve teacher knowledge in these areas. The webinar trained teachers on the following topics: ADHD symptomology in the school setting, assessments used to identify ADHD, and evidence-based interventions to support students with ADHD. Overall, our results evidence that teacher knowledge about ADHD and teacher self-efficacy in supporting students with ADHD can be improved using a brief, web-based teacher training. Consistent with a recent meta-analysis investigating the efficacy of ADHD training interventions for in-service teachers (Ward et al., 2022), the teacher training implemented in Study 2 significantly increased pre-service teachers' knowledge about ADHD. Study 2 extends prior research to offer evidence for the utility of teacher trainings for pre-service teacher populations. This finding supports the viability of earlier exposure to behavioral and classroom management principles as well as knowledge about ADHD in teacher training programs.

Additionally, pre-service teachers' self-efficacy increased in response to the brief, self-paced webinar. However, consistent with research on a teacher in-service training conducted by Latouche and Gascoigne (2019), the main effect for self-efficacy was modest compared to the effect for ADHD knowledge. There are several reasons for the modest increase in self-efficacy among pre-service teachers following this training. Latouche and Gascoigne (2019) postulate that the small but significant increase in teachers' self-efficacy post-teacher training might be attributed to teachers' already high baseline levels of self-efficacy, suggesting they feel confident in their abilities to support all students. Other authors propose that a positive response bias, where teachers tend to

present themselves in a more positive light, may explain this effect (Legato, 2011). However, neither of these explanations are likely to generalize to the pre-service teacher population included in Study 2.

Given that pre-service teachers, by definition, are in their early stages of training, it is possible that their lack of experience directly supporting students with ADHD thwarts a large increase in teacher self-efficacy post-training. Thus, one possible explanation for the modest increase in teacher self-efficacy in Study 2 is the lack of hands-on, practical experiences embedded within the webinar. In other words, by the end of the webinar teachers' knowledge about ADHD increased whereas their experiences supporting students with ADHD remained the same. A study conducted by Poznanski and colleagues (2018) provides additional support for this explanation. Following the delivery of an online ADHD and classroom management training provided to pre-service teachers, the researchers conducted a series of bivariate correlations to illuminate the association between pre-service teachers' knowledge of ADHD, knowledge of behavior principles, and their self-efficacy. Results revealed that pre-service teachers' knowledge about ADHD and behavioral principles were not significantly related to their ratings of self-efficacy (Poznanski et al., 2018). Overall, results of this dissertation support the need for a multi-component teacher training intervention that includes opportunities to improve teacher knowledge about ADHD and classroom management principles and incorporates practical applications of the knowledge obtained.

The Promise of Multi-Component Training for Fostering Teacher Development

Evidence indicates the need for a dynamic, multi-component intervention that targets teachers' knowledge about ADHD and behavioral principles, provides teachers with experiential learning opportunities, and provides feedback to the teacher as they apply the knowledge they gain from the intervention into their practice with students. One such intervention is behavioral consultation. Traditional behavioral consultation represents a four-stage problem solving process including three separate interviews. Each interview contains specific objectives that the consultant must address with the teacher [e.g., Problem Identification Interview (PII), Problem Analysis Interview (PAI), and the Problem Evaluation Interview (PEI) (Kratochwill & Bergan, 1990)]. Two of the studies included in Study 1 (i.e., Erchul et al., 2007; Erchul et al., 2009a) utilized a behavioral consultative model to improve the outcomes of students with ADHD. While students' outcomes showed improvement in response to behavioral consultation with the teacher, results from the studies also revealed that teachers' influence (e.g., domineeringness, dominance) on the consultative process, particularly during the PII, is associated with students' post-intervention outcomes. Erchul and colleagues (2009b) further explored the association between relational processes and consultation case outcomes for teachers supporting students with ADHD. Several salient relationships emerged including a negative association between teacher domineeringness and treatment integrity, a negative association for teacher dominance and intervention effectiveness, and a positive association for consultant dominance and treatment integrity. These findings are consistent with the perspective of modern school-based behavioral consultation models

which emphasize the importance of consultant responsibilities to change teachers' behaviors so that they will become more effective change agents and to foster teachers' ability to implement evidence-based interventions with integrity (Erchul et al., 2019).

Researchers have started to develop a more active approach to consultation and training for teachers: coaching. Coaching enhances the benefits of training by providing both the teacher and coach (i.e., consultant) an active role in the learning process. Coaching also targets teachers' perceptions of the student-teacher relationship, which has been identified as a potential mediator for teacher self-efficacy (Zee et al., 2017). Although, research has yet to investigate the viability of coaching for teachers of students with ADHD, coaching has been shown to improve the self-efficacy of teachers instructing autistic students (Love et al., 2020). Preliminary research has demonstrated positive effects for increased student-teacher relationship closeness following a coaching-based support program that centers a neurodiverse perspective, positive interactions with autistic students, and in-depth consultation with teachers to target misconceptions about autism (Gudknecht, 2023). Key ingredients integral to coaching include individualized, frequent, and intensive meetings that occur across an extended period of time and emphasize building teachers' specific skills in the classroom setting (Kraft et al., 2018). Four contextual elements identified as important for the design of effective coaching interventions for teachers with autistic students include employing a neurodiversity affirming lens, establishing priorities that reflect the lived experiences of autistic people, increasing teacher knowledge about autism knowledge, and developing a positive coach-teacher alliance (Hamsho et al., 2023). Considering the overlap in challenges experienced

by students with ADHD and autistic students in schools (e.g., self-regulation difficulties; Antschel & Russo, 2019), coaching offers a promising approach to supporting teachers instructing students with ADHD.

Limitations & Future Directions

This dissertation is composed of two studies that aimed to investigate the teacher-level factors that influence school-based interventions for students with ADHD. These findings should be interpreted within the context of the study's limitations. Only a small number of studies met our inclusionary criteria for the in-depth literature review in Study 1, and I did not employ a meta-analytic approach to synthesize the findings across the included studies. Meta-analytic findings provide a more precise estimate of treatment effect sizes across multiple studies, which allow for the examination of heterogenous results across studies (Haidich, 2010). Variable effect sizes emerged across the literature for results of ADHD teacher knowledge and self-efficacy trainings. A meta-analytic would have been useful for interpreting the effect sizes of the interventions included in Study 1. Moreover, an estimate of the average effect sizes across teacher training interventions would have informed the interpretation of results in Study 2.

Study 2 employed a brief training to target teachers' ADHD knowledge and self-efficacy. Similarly, most prior research has sought to improve teacher knowledge about ADHD via one-time training. Future work should aim to understand the influence of teachers' self-efficacy within the context of a classroom-based intervention study. Additionally, while Study 2 added to the limited research on pre-service teacher training, data were collected from a convenience sample of pre-service teachers from one

university. Thus, findings may not generalize to pre-service teachers at other institutions or to in-service teachers. The participants in Study 2 were recruited from an introductory education class for pre-service teachers and, therefore, their experiences supporting students with ADHD were limited. Thus, there was significant room for growth in their knowledge about ADHD which may have led to an inflated treatment effect. Additionally, the web-based, asynchronous nature of the pre-service teacher training employed in Study 2 limited participants' ability to engage in an active learning process where they could ask the trainer questions and be provided with hands-on training opportunities. Practical training opportunities would have fostered a richer training in which participants could gain experience supporting students with ADHD while receiving coaching and direct feedback about these interactions.

Finally, although Study 2 indicated that a self-paced online webinar may support the development of teacher knowledge and self-efficacy, Study 1 identified several inter- and intra- personal teacher factors as influencers on ADHD intervention effectiveness. The student-teacher relationship emerged as a particularly important factor (Power, 2009). Results from a recent meta-analysis suggests that students who present with ADHD symptoms are more likely to have student-teacher relationships that are low in closeness and high in conflict (Maclean et al., 2023). Positive student-teacher relationships have long been regarded as a facilitator for student learning (Camp, 2011). These findings correspond with students' reported feelings of teacher rejection, which leads them to exhibit higher levels of externalizing behavior, risk for school failure, and peer exclusion and rejection (Plantin-Ewe, 2019). In contrast, high-quality, close

relationships with teachers serve as a protective factor for students with ADHD (Szép, et al., 2021). Wiener and Daniels (2016) asked students about how their relationship with teachers could be improved. Students indicated they preferred teachers who understood their disability and areas of need. Students also described the importance of teacher awareness that students with ADHD generally do not deliberately act inappropriately with the intention of disturbing the classroom. Finally, students interviewed emphasized the importance of teacher characteristics such as being kind, open-minded, helpful, and approachable (Weiner & Daniels, 2016). Thus, in addition to teacher training to improve teacher knowledge of ADHD, future work should explore ways to promote positive interactions between teachers and students with ADHD to improve closeness and reduce conflict in the student-teacher relationship.

Implications for Practice

This dissertation's findings offer insights into the teacher factors that may influence implementation of school-based self-regulatory interventions for students with ADHD. For teachers, results support seeking opportunities to gain knowledge about ADHD through a teacher training. Equipping teachers with the appropriate knowledge regarding interventions for students with ADHD could help to improve teachers' self-efficacy in educating students with ADHD (Flanigan & Climie, 2018). In turn, increased teacher self-efficacy has the potential to improve intervention success and create a more effective learning environment for their students with ADHD (Fernández et al., 2021). Weiner (2020) identifies school psychologists as the school based mental health professionals best equipped to provide in-service teachers with knowledge about ADHD.

Teachers should also seek direct experience supporting students with ADHD, ideally within the context of a consultative or coaching model where they can receive feedback about their interactions and performance. When participating in a consultative intervention, teachers should actively reflect on their personal beliefs and perceptions about students with ADHD. Teachers should also observe and acknowledge their locus of control when attributing students' behaviors. At the same time, consultants are advised to actively challenge misperceptions about ADHD as well as state explicitly their observations of teachers' locus of control. It is also recommended that pre-service teacher training programs consider incorporating curriculum about ADHD, classroom management, and self-regulation into their direct instruction as well as into students' field-based experiences. Ideally, this would be a developmentally appropriate practical experience where pre-service teachers can experience supporting a student with ADHD while concurrently receiving feedback about their performance from a supervisor.

This study's findings also have implications for school psychologists, whose primary responsibilities include assessing, designing, and recommending interventions for students. School-psychologists are well equipped to provide in-service teachers with knowledge about ADHD. Additionally, consultation and collaboration are key domains in the National Association of School Psychologists best practice model (NASP, 2010). Thus, school psychologists should be prepared to provide teachers with psychoeducation about disabilities to promote teachers' understanding of students' strengths and challenges. School psychologists should also be well prepared to support the acquisition of teachers' classroom management skills through consultation interventions to support

individual cases. Consultative support may be a viable mechanism to reduce teacher stress and, potentially, improve teacher self-efficacy.

Conclusion

This dissertation identified teacher-level factors as potential barriers and facilitators for school-based interventions designed for students with ADHD. Two salient teacher-level factors were knowledge about ADHD and teacher self-efficacy. The brief web-based training employed in this dissertation is effective at improving both of these critical teacher characteristics. Self-regulatory skills are essential for students' academic success. With the wide range of evidence-based self-regulatory interventions available for students with ADHD, numerous tools are available to teachers to support students' needs. Future work should facilitate an environment where teachers are armed with the skills necessary to effectively implement the available tools.

References

Aadland, K. N., Aadland, E., Andersen, J. R., Lervåg, A., Moe, V. F., Resaland, G. K., & Ommundsen, Y. (2018). Executive function, behavioral self-regulation, and school related well-being did not mediate the effect of school-based physical activity on academic performance in numeracy in 10-year-old children. The Active Smarter Kids (ASK) study. *Frontiers in Psychology*, 9, 245.

Aglaia Stampoltzis & Katerina Antonopoulou (2013) Knowledge and misconceptions about attention deficit hyperactivity disorder: A comparison of Greek general and special education teachers. *International Journal of School & Educational Psychology*, 1:2, 122-130, DOI: 10.1080/21683603.2013.803000

Aguiar, A. P., Kieling, R. R., Costa, A. C., Chardosim, N., Dorneles, B. V., Almeida, M. R., Mazzuca, A. C., Kieling, C., & Rohde, L. A. (2014). Increasing teachers' knowledge about ADHD and learning disorders: An investigation on the role of a psychoeducational intervention. *Journal of Attention Disorders*, 18(8), 691–698.

Akbar, M., Loomis, R., & Paul, R. (2013). The interplay of language on executive functions in children with ASD. *Research in Autism Spectrum Disorders*, 7(3), 494–501.

Akdağ. B (2023) Exploring teachers' knowledge and attitudes toward attention deficit hyperactivity disorder and its treatment in a district of turkey. *Cureus*, 15(9): e45342.

Akman, Y. (2020). The role of classroom management on confidence in teachers and educational stress. *International Journal of Contemporary Educational Research,* 7(1), 335- 345.

Alkhatani, K.D.F (2013) Teachers' knowledge and misconceptions of attention deficit/hyperactivity disorder. *Psychology*, 4, 963-969.

Al-Yagon, M., Forte, D., & Avrahami, L. (2020). Executive functions and attachment relationships in children with ADHD: Links to externalizing/internalizing problems, social skills, and negative mood regulation. *Journal of Attention Disorders*, 24(13), 1876–1890.

American Psychiatric Association: The Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. American Psychiatric Publishing, Washington, DC; 2013. 10.1176/appi.books.9780890425596

Anderson, P. (2002a). Assessment and development of Executive Function (EF) during childhood. C*hild Neuropsychology*, 8(2), 71–82.

Anderson, Donnah L., Susan E. Watt, William Nobel, and Dianne C. Shanley (2012) Knowledge of attention deficit hyperactivity disorder (ADHD) and attitudes toward teaching children with ADHD: The role of teaching experience. *Psychology in the Schools,* 49:511–25.

Ansari, A. (2017). Multigrade kindergarten classrooms and children's academic achievement, executive function, and socioemotional development. *Infant and Child Development,* 26(6), e2036.

Antshel, K.M., Russo, N. Autism Spectrum Disorders and ADHD: Overlapping Phenomenology, Diagnostic Issues, and Treatment Considerations. Curr Psychiatry Rep 21, 34 (2019).

Arcia, E., Frank, R., Sánchez-LaCay, A., & Fernáindez, M. C. (2000). Teacher understanding of ADHD as reflected in attributions and classroom strategies. *Journal of Attention Disorders,* 4(2), 91–101.

Arnold, L.E., Hodgkins, P., Kahle, J., Madhoo, M., Kewley, G. (2020) Long-term outcomes of ADHD: Academic achievement and performance. *Journal of Attention Disorders*, 24(1):73-85.

Ashburner J, Ziviani J, & Rodger S (2010). Surviving in the mainstream: Capacity of children with autism spectrum disorders to perform academically and regulate their emotions and behavior at school. *Research in Autism Spectrum Disorders,* 4(1), 18–27.

Barbaresi, W. J., Katusic, S. K., Colligan, R. C., Weaver, A. L., & Jacobsen, S. J. (2007). Long-term school outcomes for children with attention-deficit/hyperactivity disorder: a population-based perspective. *Journal of Developmental and Behavioral Pediatrics: JDBP*, 28(4), 265–273.

Barkley, R. A., Fischer, M., Edelbrock, C. S., & Smallish, L. (1990). The adolescent outcome of hyperactive children diagnosed by research criteria: I. An 8-Year prospective follow-up study. *Journal of the American Academy of Child & Adolescent Psychiatry*, 29(4), 546-557.

Barkley, R. A. (2006). Attention-Deficit/Hyperactivity Disorder. In D. A. Wolfe (Ed.), Behavioral and emotional disorders in adolescents: Nature, assessment, and treatment, Vol. 719, pp. 91–152. Guilford Publications, xvi.

Barkley, R. A. (2007). School Interventions for Attention Deficit Hyperactivity Disorder: Where to From Here? *School Psychology Review*, 36(2), 279–286.

Barkley, R. A., Murphy, K. R., & Fischer, M. (2010). ADHD in adults: What the science says. Guilford Press.

Barkley, R. A. (Ed.). (2014). Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment. Guilford Publications.

Barry, T. D., Lyman, R. D., & Klinger, L. G. (2002). Academic underachievement and attention deficit hyperactivity disorder: The negative impact of symptom severity on school performance. *Journal of School Psychology*, 40(3), 259–283.

Berdan, L. E., Keane, S. P., & Calkins, S. D. (2008). Temperament and externalizing behavior: Social preference and perceived acceptance as protective factors. *Developmental Psychology*, 44(4), 957–968.

Berkovits L, Eisenhower A, & Blacher J (2017). Emotion regulation in young children with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, 47(1), 68–79. 10.1007/s10803-016-2922-2.

Best, J. R., & Miller, P. H. (2010). A developmental perspective on executive function: Development of executive functions. *Child Development*, 81(6), 1641–1660.

Biederman, J., Monuteaux, M. C., Doyle, A. E., Seidman, L. J., Wilens, T. E., Ferrero, F., Morgan, C. L., & Faraone, S. V. (2004). Impact of executive function deficits and attention-deficit/hyperactivity disorder (ADHD) on academic outcomes in children. *Journal of Consulting and Clinical Psychology*, 72(5), 757–766.

Birchwood, J., & Daley, D. (2012). Brief report: The impact of attention deficit hyperactivity disorder symptoms on academic performance in an adolescent community sample. *Journal of Adolescence*, 35(1), 225–231.

Blair, C., Calkins, S., & Kopp, L. (2010). Self-Regulation as the interface of emotional and cognitive development. In R. H. Hoyle (Ed.), Handbook of Personality and Self-Regulation (pp. 64–90). Wiley-Blackwell.

Blair, C. (2016). Developmental science and executive function. *Current Directions in Psychological Science*, 25(1), 3–7.

Block, J. A., Santa Ana, E., Rodriguez, M. L., & Colsman, M. (2002). Delay of gratification: Impulsive choices and problem behaviors in early and late adolescence. *Journal of Personality*, 70(4), 533–552.

Bolinger, S.J., Mucherah, W., Markelz, A., Teacher knowledge of attention-deficit/hyperactivity disorder and classroom management. *Journal of Special Education Apprenticeship*, 9 (1): 2167-3454.

Bradshaw, L., & Kamal, M. (2013). Teacher knowledge, training and acceptance of students with ADHD in their classrooms: Qatar case study. *Near and Middle Eastern Journal of Research in Education*, 2013, 5.

Bridgett, D. J., Oddi, K. B., Laake, L. M., Murdock, K. W., & Bachmann, M. N. (2013). Integrating and differentiating aspects of self-regulation: Effortful control, executive functioning, and links to negative affectivity. *Emotion*, 13(1), 47–63.

Briesch, A. M., Chafouleas, S. M., Neugebauer, S. R., & Riley-Tillman, T. C. (2013). Assessing influences on intervention implementation: Revision of the Usage Rating Profile-Intervention. *Journal of School Psychology*, 51(1), 81–96.

Bufferd, S. J., Dougherty, L. R., Olino, T. M., Dyson, M. W., Laptook, R. S., Carlson, G. A., & Klein, D. N. (2014). Predictors of the onset of depression in young children: A multi-method, multi-informant longitudinal study from ages 3 to 6. *Journal of Child Psychology and Psychiatry*, 55(11), 1279–1287.

Burgess, P.W. (2010) Assessment of Executive Function. In, J.M. Gurd, U. Kischka, J.C. Marshall (Eds.), Handbook of Clinical Neuropsychology. Oxford University Press.

Bussing, R., Zima, B. T., & Perwien, A. R. (2000). Self-Esteem in special education children with ADHD: Relationship to disorder characteristics and medication use. *Journal of American Academic Child Adolescent Psychiatry*, 10, 1260-1269.

Caplan, G. (1963). Types of mental health consultation. *American Journal of Orthopsychiatry*, 3, 470–481.

Capizzi, R. R. (2018). ADHD and the elementary school teacher: Personal experience and professional knowledge, self-efficacy, and attitude toward students diagnosed with ADHD (Order No. 10810396). Available from ProQuest Dissertations & Theses A&I; ProQuest Dissertations & Theses Global. (2037314433). Retrieved from https://www.proquest.com/dissertations-theses/adhd-elementary-school-teacher-personal/docview/2037314433/se-2

Cherng, H.Y. (2017) "If they think I can": Teacher bias and youth of color expectations and achievement. *Social Science Research*, 66:170–86.

Clark, C. A., Pritchard, V. E., & Woodward, L. J. (2010). Preschool executive functioning abilities predict early mathematics achievement. *Developmental Psychology*, 46, 1176–1191.

Coghill, D. (2010). The impact of medications on quality of life in attention deficit hyperactivity disorder: A systematic review. CNS Drugs, 24(10), 843–866.

Coles, E. K., Owens, J. S., Serrano, V. J., Slavec, J., & Evans, S. W. (2015). From consultation to student outcomes: The role of teacher knowledge, skills, and beliefs in increasing integrity in classroom management strategies. *School Mental Health*, 7(1), 34–48. =

Corkum, P., Elik, N., Blotnicky-Gallant, P. A. C., McGonnell, M., & McGrath, P. (2019). Web-based intervention for teachers of elementary students with ADHD: Randomized controlled trial. *Journal of Attention Disorders*, 23(3), 257–269.

Crisci, G., Caviola, S., Cardillo, R., & Mammarella, I. C. (2021). Executive functions in neurodevelopmental disorders: Comorbidity overlaps between attention deficit and hyperactivity disorder and specific learning disorders. *Frontiers in Human Neuroscience*, 15, 594234.

Daley, D., & Birchwood, J. (2010). ADHD and academic performance: Why does ADHD impact on academic performance and what can be done to support ADHD children in the classroom?, *Child: Care Health and Development*, 36(4), 455–464. h

Danielson, M. L., Bitsko, R. H., Holbrook, J. R., Charania, S. N., Claussen, A. H., McKeown, R. E., Cufe, S. P., Owens, J. S., Evans, S. W., Kubicek, L., & Flory, K. (2021). Community-based prevalence of externalizing and internalizing disorders among school-aged children and adolescents in four geographically dispersed school districts in the United States. *Child Psychiatry & Human Development*, 52(3), 500–514.

David, N. (2013) 'ADHD in Indian elementary classrooms: Understanding teacher perspectives.' *International Journal of Special Education*, 28 (2), pp. 1–16.

Davidson, M. C., Amso, D., Anderson, L. C., & Diamond, A. (2006). Development of cognitive control and executive functions from 4 to 13 years: Evidence from manipulations of memory, inhibition, and task switching. *Neuropsychologia*, 44(11), 2037–2078.

Dembo, R., Wareham, J., Schmeidler, J., & Winters, K. C. (2016). Exploratory two-level analysis of individual-and school-level factors on truant youth emotional/psychological functioning. *The Journal of Educational Research*, 109(6), 596–607.

DeShazer. M.R., Owens, J.S., Himawan, L.K. (2023) Understanding factors that moderate the relationship between student ADHD behaviors and teacher stress. *School Mental Health*, 15:722–736.

Dicke, T., Philip, P., Herbert, M., Mareike, K., Schmeck, A., & Detley, L. (2014). Self-efficacy in classroom management, classroom disturbances, and emotional exhaustion: A moderated mediation analysis of teacher candidates. *Journal of Educational Psychology*, 106(2), 569–583.

DiPiazza, R.K., Palmer, R.C. (2023, February 7-11) Breezing through: A tier 2 guide for executive functioning [Conference presentation]. NASP 2023 Convention, Denver,

CO, United States.https://apps.nasponline.org/professional-development/convention/session-detail.aspx?ID=25254

Duffin, L. C., French, B. F., & Patrick, H. (2012). The Teachers' Sense of Efficacy Scale: Confirming the factor structure with beginning pre-service teachers. *Teaching and Teacher Education*, 28(6), 827–834.

DuPaul, G.J., Evans, S.W., Mautone, J.A., Sarno Owens, J., & Power, T.J. (2020). Future directions for psychosocial interventions for children and adolescents with ADHD, *Journal of Clinical Child & Adolescent Psychology*, 49(1), 134–45.

DuPaul, G. J., Chronis-Tuscano, A., Danielson, M. L., & Visser, S. N. (2019). Predictors of receipt of school services in a national sample of youth with ADHD. *Journal of Attention Disorders*, 23(11), 1303–1319

DuPaul, G., Chronis-Tuscano, A., Danielson, M., Visser, S. (2018) Predictors of receipt of school services in a national sample of youth with ADHD. *Journal of Attention Disorders*, 23(11): 1301-1319.

DuPaul, G. J., Morgan, P. L., Farkas, G., Hillemeier, M. M., & Maczuga, S. (2016). Academic and social functioning associated with attention-deficit/hyperactivity disorder: Latent class analyses of trajectories from kindergarten to fifth grade. *Journal of Abnormal Child Psychology*, 44(7) 1425-1438.

DuPaul, G. J., Eckert, T. L., & Vilardo, B. (2012). The effects of school-based interventions for attention deficit hyperactivity disorder: A meta-analysis 1996–2010. *School Psychology Review*, 41(4), 387–412.

DuPaul, G. J., Rapport, M.D., & Perriello, L.M. (1991). Teacher ratings ofacademic skills: The development of the Academic Performance Rating Scale. *School Psychology Review*, 20 (2), 284–300.

Eisenberg, N., Spinrad, T. L., & Eggum, N. D. (2010). Emotion-Related Self-Regulation and Its Relation to Children's Maladjustment. *Annual Review of Clinical Psychology*, 6(1), 495–525.

Eisenberg, N. (2017). Commentary: What's in a word (or words) - on the relations among self-regulation, self-control, executive functioning, effortful control, cognitive control, impulsivity, risk-taking, and inhibition for developmental psychopathology - reflections on Nigg. *Journal of Child Psychology and Psychiatry*, 58(4), 384–386.

Eisenberg, n., Spinrad, T. L., & Eggum, n. D. (2010). Emotion-related self-regulation and its relation to children's maladjustment. *Annual Review of Clinical Psychology*, 6, 495–525.

Elliott, S. N. & Von Brock Treuting, M. (1991), The Behavior Intervention Rating Scale: Development and validation of a pretreatment acceptability and effectiveness measure. *Journal of School Psychology,* 29 (1), 43–51.

Engel de Abreu, P. M. J., Abreu, N., Nikaedo, C. C., Puglisi, M. L., Tourinho, C. J., Miranda, M. C., Befi-Lopes, D. M., Bueno, O. F. A., & Martin, R. (2014). Executive functioning and reading achievement in school: A study of Brazilian children assessed by their teachers as poor readers. *Frontiers in Psychology,* 5.

Erchul, W. P., Schulte, A. C., Johnson, A. H., & Geraghty, C. A. (2019). Adults as change agents: Applications of behavioral consultation. In S. G. Little & A. Akin-Little (Eds.), Behavioral interventions in schools: Evidence-based positive strategies (2nd ed., pp. 171–188). American Psychological Association.

Erchul, W.P., DuPaul, G.J.., Bennett, M.S., Grissom, P.F.., Jitendra, A.K., Tresco, K.E., Volpe, R.J., Vile Junod, R.E., Flammer-Rivera, L.M., Mannella, M.C (2009b) A Follow-up Study of Relational Processes and Consultation Outcomes for Students with Attention Deficit Hyperactivity Disorder. *School Psychology Review*, 38:1, 28-37

Erchul, W. P., DuPaul, G. J., Bennett, M. S., Grissom, P. F., Jitendra, A. K., Tresco, K. E., Volpe, R. J., Vile Junod, R. E., Flammer-Rivera, L. M., & Mannella, M. C. (2009a). A follow-up study of relational processes and consultation outcomes for students with attention deficit hyperactivity disorder, *School Psychology Review*, 38(1), 28–37.

Erchul, W. P., DuPaul, G.J., Grissom, P.F., Vile Junod, R.E., Jitendra, A.K., Mannella, M.C., Tresco, K.E., Flammer-Rivera, L.M., & Volpe, R. J. (2007) Relationships among relational communication processes and consultation outcomes for students with attention deficit hyperactivity disorder. *School Psychology Review*, 36 (1), 111–29.

Evans, S. W., Owens, J. S., Wymbs, B. T., & Ray, A. R. (2018). Evidence-based psychosocial treatments for children and adolescents with attention deficit/hyperactivity disorder. *Journal of Clinical Child & Adolescent Psychology,* 47(2), 157–198

Fabiano, G. A., Vujnovic, R. K., Pelham, W. E., Waschbusch, D. A., Massetti, G. M., Pariseau, M. E., Naylor, J., Yu, J., Robins, M., Carnefix, T., Greiner, A. R., & Volker, M. (2010). Enhancing the effectiveness of special education programming for children with attention deficit hyperactivity disorder using a daily report card. *School Psychology Review*, 39(2), 219–239.

Fabiano, G. A., Schatz, N. S., Aloe, A. M., Pelham, W. E., Smyth, A. C., Zhao, X., Merrill, B., Macphee, F., Ramos, M., Hong, N., Altszuler, A., Ward, L., Rodgers, D. B.,

Liu, Z., Karatoprak, R., & Coxe, S. (2021). Comprehensive meta-analysis of attention deficit/hyperactivity disorder psychosocial treatments investigated within between group studies. *Review of Educational Research*, 91, 718–760

Fabiano, G., Naylor, J., Pelham, W.E., Gnangy, E.M., Burrows-MacLean, L., Coles, E., Chacko, A. Wxmonsky., J. (2022) Special education for children with ADHD: Services received and a comparison to children with ADHD in general education, *School Mental Health*, 12: 818-830.

Fabio RA, Mento C, Gangemi A, Picciotto G. (2023) ADHD Symptoms Increase Perception of Classroom Entropy and Impact Teacher Stress Levels. *Children (Basel)*, 10(6):1082.

Fairbanks, L. D., & Stinnett, T. A. (1997). Effects of professional group membership, intervention type, and diagnostic label on treatment acceptability. *Psychology in the Schools*, 34(4), 329–335.

Faul, F., Erdfelder, E., Lang, AG. et al. (2007) G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175–191.

Filter, K.J., Systma, M.R., McIntosh, K. (2016) A Brief Measure of Staff Commitment to Implement School-Wide Positive Behavioral Interventions and Supports. *Assessment for Effective Intervention*, 42 (1): 18-31.

Fives, H., & Buehl, M. M. (2009). Examining the factor structure of the Teachers' Sense of Efficacy Scale. *The Journal of Experimental Education*, 78(1), 118–134.

Fives, H., & Gill, M. G. (Eds.). (2015). International handbook of research on teachers' beliefs. Routledge.

Flanigan, L., & Climie, E. (2018). Teachers' Knowledge of ADHD: Review and Recommendations. *Emerging Perspectives: Interdisciplinary Graduate Research in Education* and Psychology, 2(1), 1–13.

Fried, R., Petty, C., Faraone, S. V., Hyder, L. L., Day, H., & Biederman, J. (2016). Is ADHD a risk factor for high school dropout? a controlled study. *Journal of Attention Disorders*, 20(5), 383–389.

Freeman, J., Simonsen, B., Briere, D. E., & MacSuga-Gage, A. S. (2014). Pre-service teacher training in classroom management: A review of state accreditation policy and teacher preparation programs. *Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children*, 37(2), 106–120.

Gaastra, G. F., Groen, Y., Tucha, L., & Tucha, O. (2016). The effects of classroom interventions on off-task and disruptive classroom behavior in children with symptoms attention deficit hyperactivity disorder: A meta-analytic review. *PLOS ONE*, 11(2), e0148841.

Galéra, C., Melchior, M., Chastang, J.-F., Bouvard, M.-P., & Fombonne, E. (2009). Childhood and adolescent hyperactivity-inattention symptoms and academic achievement 8 years later: the GAZEL Youth study. *Psychological Medicine*, 39(11), 1895–1906.

Greene, R. W. (1995). Students with ADHD in school classrooms: Teacher factors related to compatibility, assessment, and intervention. *School Psychology Review*, 24(1), 81–93.

Greene, R. W., Beszterczey, S. K., Katzenstein, T., Park, K., & Goring, J. (2002). Are students with ADHD more stressful to teach? Patterns of teacher stress in an elementary school sample. *Journal of Emotional and Behavioral Disorders*, 10(2), 79–89.

Greenway, C. W., & Rees Edwards, A. (2020). Knowledge and attitudes towards attention-deficit hyperactivity disorder (ADHD): A comparison of teachers and teaching assistants. *Australian Journal of Learning Difficulties*, 25(1), 31–49.

Groenewald, C., Emond, A., & Sayal, K. (2009). Recognition and referral of girls with attention deficit hyperactivity disorder: Case vignette study. Child: Care, *Health and Development*, 35(6), 767–772.

Guerra, F. R., & Brown, M. S. (2012). Teacher knowledge of attention deficit hyperactivity disorder among middle school students in south Texas. *RMLE Online*, 36(3), 1–7.

Guerra, F., Tiwari, A., Das, A., Cavazos Vela, J., & Sharma, M. (2017). Examining teachers' understanding of attention deficit hyperactivity disorder. *Journal of Research in Special Educational Needs*, 17(4), 247–256.

Gudknecht, J. (2023 April 24). Smooth Sailing Using the Neurodiversity Paradigm: Developing Positive Classrooms Experiences for Autistic Students. Inside IES Research. https://ies.ed.gov/blogs/research/post/smooth-sailing-using-the-neurodiversity-paradigm-developing-positive-classrooms-experiences-for-autistic-students

Haidich, A.B. (2010) Meta-analysis in medical research. *Hippokratia*. (Suppl 1):29-37. PMID: 21487488; PMCID: PMC3049418.

Hariton, E., & Locascio, J. J. (2018). Randomised controlled trials - the gold standard for effectiveness research: Study design: randomised controlled trials. BJOG: *An International Journal of Obstetrics & Gynecology*, 125(13), 1716–1716.

Hinshaw, S. P. (2007). Moderators and mediators of treatment outcome for youth with ADHD: Understanding for whom and how interventions work. *Journal of Pediatric Psychology*, 32(6), 664–675.

Hinshaw, S. P. (2017). Attention deficit hyperactivity disorder (ADHD): Controversy, developmental mechanisms, and multiple levels of analysis. *Annual Review of Clinical Psychology*, 14, 291– 316.

Hodgkins, P., Arnold, L. E., Shaw, M., Caci, H., Kahle, J., Woods, A. G., & Young, S. (2012). A systematic review of global publication trends regarding long-term outcomes of ADHD. *Frontiers in Psychiatry*, 2.

Holz, T. & Lessing, A. (2002) 'Reflections of attention deficit hyperactivity disorder. (ADHD) in an inclusive education system. *Perspectives in Education*, 20 (3), pp. 103–10.

Hoza, B. (2007). Peer functioning in children with ADHD. *Journal of Pediatric Psychology*, 32(6), 655–663.

Hustus, C. L., Evans, S. W., Owens, J. S., Benson, K., Hetrick, A. A., Kipperman, K., & DuPaul, G. J. (2020). An evaluation of 504 and individualized education programs for high school students with attention deficit hyperactivity disorder. *School Psychology Review*, 49(3), 333–345

Individuals with Disabilities Education Act, 20 U.S.C. § 1400 (2004)

Irizarry, Y. (2015b) Utilizing multidimensional measures of race in education research: The case of teacher perception. *Sociology of Race and Ethnicity*, 1:564–83.

Jacobson, L. A., Williford, A. P., & Pianta, R. C. (2011). The role of executive function in children's competent adjustment to middle school. *Child Neuropsychology*, 17(3), 255–280.

Jarque Fernández S, Amado Luz L, Oporto Alonso M, Fernández-Andújar M. (2021) Effectiveness of a Long-Term Training Programme for Teachers in Attention-Deficit/Hyperactivity Disorder on Knowledge and Self-Efficacy. *Mathematics*, 9 (12):1414.

Jensen, P. S., & Cooper, J. R. (2002). Attention deficit hyperactivity disorder: State of the science, Best Practices. Civic Research Institute, Inc.

Jones, H. A., & Chronis-Tuscano, A. (2008). Efficacy of teacher in-service training for attention-deficit/hyperactivity disorder: Teacher in-service training for ADHD. *Psychology in the Schools*, 45(10), 918–929.

Kazdin, Alan. E. (2011). Single Case Research Designs: Methods for Clinical and Applied Settings. Oxford University Press.

Kincaid, D., Childs, C., Blasé, K. A., & Wallace, F. (2007). Identifying barriers and facilitators in implementing school- wide positive behavior support. *Journal of Positive Behavior Support,* 9, 174–184.

Kiresuk, T., Smith, A., & Cardillo, J.E. (Eds.) (1994). Goal Attainment Scaling: Applications, Theory and Measurement. Hillsdale, NJ: Erlbaum.

Klassen, R. M., Bong, M., Usher, E. L., Chong, W. H., Huan, V. S., Wong, I. Y. F., & Georgiou, T. (2009). Exploring the validity of a teachers' self-efficacy scale in five countries. *Contemporary Educational Psychology,* 34(1), 67–76.

Klassen, R. M., & Tze, V. M. C. (2014). Teachers' self-efficacy, personality, and teaching effectiveness: A meta-analysis. *Educational Research Review*, 12, 59–76.

Kochanska, G., Coy, K. C., & Murray, K. T. (2001). The development of self-regulation in the first four years of life. *Child Development,* 72(4), 1091–1111.

Kos, J. M., Richdale, A. L., & Jackson, M. S. (2004). Knowledge about attention deficit/ hyperactivity disorder: A comparison of in-service and preservice teachers. *Psychology in the Schools,* 41(5), 517–526.

Kos, J. M., Richdale, A.L., Hay, D. (2006). Children with attention deficit hyperactivity disorder and their teachers: A review of the literature, *International Journal of Disability, Development and Education*, 53(2), 147–60.

Krtek, A., Maniakova, K., Rudnicka, RK (2022) Ambivalent bons, positive and negative emotions, and expectations in teachers' perceptions of relationship with their students with ADHD. *International Journal of Qualitative Studies on Health and Well-being,* 17:1, 20882456.

Krueger, R. F., Caspi, A., Moffitt, T. E., White, J., & Stouthamer-Loeber, M. (1996). Delay of gratification, psychopathology, and personality: Is low self-control specific to externalizing problems? *Journal of Personality,* 64(1), 107–129.

Langberg, J. M., Epstein, J. N., Girio-Herrera, E., Becker, S. P., Vaughn, A. J., & Altaye, M. (2011a). Materials organization, planning, and homework completion in middle-school students with ADHD: Impact on academic performance. *School Mental Health,* 3(2), 93–101.

Langberg, J.M., Molina, B.S.G., Eugene Arnold, L., Epstein, J.N., Altaye, M., Hinshaw, S.P., Swanson, J.M., Wigal, T., & Hechtman, L. (2011b), Patterns and predictors of adolescent academic achievement and performance in a sample of children with attention-deficit/hyperactivity disorder. *Journal of Clinical Child & Adolescent Psychology*, 40 (4), 519–31.

Larrivee, B., & Cook, L. (1979). Mainstreaming: A study of the variables affecting teacher attitude. *Journal of Special Education* 13 (3), 315–24.

Latouche, A. P., & Gascoigne, M. (2019). In-service training for increasing teachers' ADHD knowledge and self-efficacy. *Journal of Attention Disorders*, 23(3), 270–281.

Lawrence, K., Estrada, R. D., & McCormick, J. (2017). Teachers' experiences with and perceptions of students with attention deficit/hyperactivity disorder. *Journal of Pediatric Nursing*, 36, 141–148.

Lee, J.Y. (2014). Predictors of teachers' intention to refer students with ADHD to mental health professionals: Comparison of U.S. and South Korea. *School Psychology Quarterly,* 29(4), 385–394.

Legato, L. J. (2011). Effects of teacher factors on expectations of students with ADHD, College of Liberal Arts & Social Sciences Theses and Dissertations, Paper 66, Retrieved from http://via.library.depaul.edu/etd/66

Lin, B., Liew, J., & Perez, M. (2019). Measurement of self-regulation in early childhood: Relations between laboratory and performance-based measures of effortful control and executive functioning. *Early Childhood Research Quarterly,* 47, 1–8.

Little, M. H. (2016). Measuring more: schools, teachers, and the development of kindergartners executive function skills. *AERA Open*, 2(3), 233285841666581.

Ljusberg, A. L. (2011a). The structured classroom. *International Journal of Inclusive Education*, 15, 195-210.

Loe, I. M., & Feldman, H.M. (2007). Academic and educational outcomes of children with ADHD. *Journal of Pediatric Psychology,* 32 (6): 643–54.

Lohrman, S., Martin, S. D., & Patil, S. (2013). Internal and external coaches' perspectives about overcoming barriers to universal interventions. *Journal of Positive Behavior Interventions,* 15, 26–38.

Losh, A., Eisenhower, A., Blacher, J. (2022) Impact of student-teacher relationship quality on classroom behavioral engagement for young students on the autism spectrum, *Research in Autism Spectrum Disorders,* 98 (2022) 102027.

Maclean, J., Krause, A., Rogers, M.A. (2023) The student-teacher relationship and ADHD symptomatology: A meta-analysis. *Journal of School Psychology*, 99, 101217, ISSN 0022-4405.

Mandracchia, N.R. & Sims, W.A. (2020) Development of the Usage Rating Profile- Web Resource (URP-WR): Using Assessment to Inform Web Resource Selection. *Computers in Schools*, v 37 n4, p269-291.

Marken, S., Agrawal, S. (2022). K-12 Workers Have Highest Burnout Rate in U.S. Gallup Poll. Retrieved from https://news.gallup.com/poll/393500/workers-highest-burnout-rate.aspx.

Martinussen, R., Tannock, R., & Chaban, P. (2011). Teachers' reported use of instructional and behavior management practices for students with behavior problems: Relationship to role and level of training in ADHD. *Child & Youth Care Forum*, 40(3), 193–210.

Marzocchi, G. M., Lucangeli, D., De Meo, T., Fini, F., & Cornoldi, C. (2002). The disturbing effect of irrelevant information on arithmetic problem solving in inattentive children. *Developmental Neuropsychology*, 21(1), 73–92.

Maunder, R., & Monks, C. P. (2019). Friendships in middle childhood: Links to peer and school identification, and general self-worth. *British Journal of Developmental Psychology*, 37(2), 211–229.

McCarthy, C., Lineback, S., Reiser, J. (2014) Teacher Stress, Emotion, and Classroom Management. Handbook of Classroom Management. 2nd Edition. Routledge.

McClelland, M. M., Cameron, C. E., Duncan, R., Bowles, R. P., Acock, A. C., Miao, A., & Pratt, M. E. (2014). Predictors of early growth in academic achievement: The head-toes-knees-shoulders task. *Frontiers in Psychology*, 5.

McCoy, D. C. (2019). Measuring young children's executive function and self-regulation in classrooms and other real-world settings. *Clinical Child and Family Psychology Review*, 22(1), 63–74.

McDougal, E., Tai, C., Stewart, T., Booth, J.N., Rhodes, S.M. (2023) *Journal of Autism and Developmental Disorders*, 53: 3406–3421.

McGrath. (2019) Web-based intervention for teachers of elementary students with ADHD: Randomized controlled trial. *Journal of Attention Disorders*, 23(3): 257–69.

McMahon, S. E. (2012). Doctors diagnose, teachers label: The unexpected in pre-service teachers' talk about labelling children with ADHD. *International Journal of Inclusive Education*, 16, 249-264.

McQuade, J. D., & Hoza, B. (2015). Peer relationships of children with ADHD. In R. A. Barkley (Ed.), Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment (pp. 210-222). New York, NY: Guilford Press.

Metzger, A.N. & Hamilton, L.T. (2021) The stigma of ADHD: Teacher ratings of labeled students. *Sociological Perspectives,* 64(2): 258-279.

Mezzanotte, C. (2020). Policy approaches and practices for the inclusion of students with attention deficit hyperactivity disorder (ADHD) *OECD Education,* 238.

Miranda, A., Jarque, S., & Tarraga, R. (2006). Interventions in school settings for students with ADHD. *Exceptionality*, 14, 35-52

Moher, D., Liberati, A., Tetzlaff, J. Altman, D.G., & PRISMA Group (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Medicine,* 6 (7), e1000097.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., Houts, R., Poulton, R., Roberts, B. W., Ross, S., Sears, M. R., Thomson, W. M., & Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, 108(7), 2693–2698.

Moll, K., Snowling, M. J., Göbel, S. M., & Hulme, C. (2015). Early language and executive skills predict variations in number and arithmetic skills in children at family-risk of dyslexia and typically developing controls. *Learning and Instruction,* 38, 53–62.

Monteiro, E. M. (2021). An ecologically valid understanding of executive functioning. *Psychology in the Schools,* pits.22627.

Moore, D.A.; Gwernan-Jones, R.; Richardson, M.; Racey, D.; Rogers, M.; Stein, K.; Thompson-Coon, J.; Ford, T.J.; Garside, R. (2016) The experiences of and attitudes toward non-pharmacological interventions for attention-deficit/hyperactivity disorder used in school settings: A systematic review and synthesis of qualitative research. Emotion and Behavior Difficulties, 21, 61–82

Moos, R. & Edison, T. (1974) Classroom Environment Scale. Palo Alto, CA: Consulting Psychologists Press.

Morris, D. B., Usher, E. L., & Chen, J. A. (2017). Reconceptualizing the sources of teaching self-efficacy: A critical review of emerging literature. *Educational Psychology Review,* 29(4), 795–833.

Moulding, L. R., Stewart, P. W., & Dunmeyer, M. L. (2014). Pre-service teachers' sense of efficacy: Relationship to academic ability, student teaching placement characteristics, and mentor support. *Teaching and Teacher Education*, 41, 60–66.

MTA Cooperative Group (1999) Moderators and mediators of treatment response for children with Attention-Deficit/Hyperactivity Disorder: The multimodal treatment study of children with Attention-Deficit/Hyperactivity Disorder. *Arch Gen Psychiatry,* 56(12):1088–1096.

MTA Cooperative Group (2004) National Institute of Mental Health Multimodal Treatment Study of ADHD follow-up: 24-Month outcomes of treatment strategies for attention-deficit/hyperactivity disorder. *Pediatrics*, 113(4), 754–61.

Mueller, A. K., Fuermaier, A. B. M., Koerts, J., & Tucha, L. (2012). Stigma in attention deficit hyperactivity disorder. *Attention Deficit and Hyperactivity Disorders*, 4(3), 101–114.

Murray, D. W., Molina, B.S.G., Glew, K., Houck, P., Greiner, A., Fong, D., Swanson, J (2014). Prevalence and characteristics of school services for high school students with attention-deficit/hyperactivity disorder. *School Mental Health,* 6(4), 264–78.

National Association of School Psychologists. (2010). NASP model for comprehensive and integrated school psychological services.

National Center for Education Statistics. (2023). Students With Disabilities. Condition of Education. U.S. Department of Education, Institute of Education Sciences. Retrieved from https://nces.ed.gov/programs/coe/indicator/cgg

Nelson, T. D., Kidwell, K. M., Nelson, J. M., Tomaso, C. C., Hankey, M., & Espy, K. A. (2018). Preschool executive control and internalizing symptoms in elementary school. *Journal of Abnormal Child Psychology,* 46(7), 1509–1520.

Nesbitt, K. T., Farran, D. C., & Fuhs, M. W. (2015). Executive function skills and academic achievement gains in prekindergarten: Contributions of learning-related behaviors. *Developmental Psychology,* 51(7), 865–878.

Nigg, J. T. (2017). Annual Research Review: On the relations among self-regulation, self-control, executive functioning, effortful control, cognitive control, impulsivity, risk-taking, and inhibition for developmental psychopathology. *Journal of Child Psychology and Psychiatry,* 58(4), 361–383.

Otterman, D. L., Koopman-Verhoeff, M. E., White, T. J., Tiemeier, H., Bolhuis, K., & Jansen, P. W. (2019). Executive functioning and neurodevelopmental disorders in early childhood: A prospective population-based study. *Child and Adolescent Psychiatry and Mental Health,* 13(1), 38.

Owens, J. S., Coles, E. K., Evans, S. W., Himawan, L. K., Girio-Herrera, E., Holdaway, A. S., Zoromski, A. K., Schamberg, T., & Schulte, A. C. (2017). Using multi-component consultation to increase the integrity with which teachers implement behavioral classroom interventions: A pilot study. *School Mental Health*, 9(3), 218–234.

Owens, J. S., Holdaway, A. S., Smith, J., Evans, S. W., Himawan, L. K., Coles, E. K., Girio-Herrera, E., Mixon, C. S., Egan, T. E., & Dawson, A. E. (2018). Rates of common classroom behavior management strategies and their associations with challenging student behavior in elementary school. *Journal of Emotional and Behavioral Disorders*, 26(3), 156–169.

Pagani, L. S., Fitzpatrick, C., & Parent, S. (2012). Relating kindergarten attention to subsequent developmental pathways of classroom engagement in elementary school. *Journal of Abnormal Child Psychology*, 40(5), 715–725.

Pelham, W.E., Greiner, A. R., & Gnagy, E.M. (2008) Student Behavior Teacher Response Observation Code Manual. Unpublished manual.

Pennington, B. F., & Ozonoff, S. (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry*, 37(1), 51–87.

Perold, M., Louw, C., & Kleynhans, S. (2010). Primary school teachers' knowledge and misperceptions of attention deficit hyperactivity disorder (ADHD*). South African Journal of Education*, 30(3), 457–473.

Pianta, R.C. (2001). Student-Teacher Relationship Scale: Professional Manual. Lutz, FL: Psychological Assessment Resources.

Pfiffner, L. J., & DuPaul, G. J. (2015). Treatment of ADHD in school settings. *Attention-Deficit Hyperactivity Disorder: A handbook for Diagnosis and Treatment,* edited by Russell A. Barkley, 596–629. The Guilford Press.

Plantin Ewe, L., (2019) ADHD symptoms and the teacher-student relationship: A systematic literature review. *Emotional and Behavioral Difficulties*, 24 (2): 136-155.

Polanczyk, G., de Lima, M. S., Horta, B. L., Biederman, J., & Rohde, L. A. (2007). The worldwide prevalence of ADHD: A systematic review and meta regression analysis. *American Journal of Psychiatry,* 164(6): 942-948.

Polanczyk, G. V., Willcutt, E. G., Salum, G. A., Kieling, C., & Rohde, L. A. (2014). ADHD prevalence estimates across three decades: An updated systematic review and meta-regression analysis. *International Journal of Epidemiology,* 43(2), 434–442.

Power, T. J., Hess, L. E., & Bennett, D. S. (1995). The acceptability of interventions for attention-deficit hyperactivity disorder among elementary and middle school teachers. *Journal of Developmental and Behavioral Pediatrics*, 16(4), 238–243.

Power, T. J., Soffer, S. L., Mautone, J. A., Costigan, T. E., Jones, H. A., Clarke, A. T., & Marshall, S. A. (2009). An analysis of teacher investment in the context of a family–school intervention for children with ADHD. *School Mental Health*, 1(3), 107–117.

R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.

Reid, R., Trout, A. L., & Schartz, M. (2005). Self-regulation interventions for children with attention deficit/hyperactivity disorder. *Exceptional Children*, 71(4), 361-377

Robson, D. A., Allen, M. S., & Howard, S. J. (2020). Self-regulation in childhood as a predictor of future outcomes: A meta-analytic review. *Psychological Bulletin*, 146(4), 324–354.

Rogers, E.L. & Farace R.V., (1975) Analysis of Relational Communication in Dyads: New Measurement Procedures. *Human Communication Research,* (1) 222–239.

Rose, J.S., & Medway, F.J. (1981) Teacher locus of control, teacher behavior, and student behavior as determinants of student achievement. *The Journal of Educational Research*, 74(6), 375–81.

Röthlisberger, M., Neuenschwander, R., Cimeli, P., & Roebers, C. M. (2013). Executive functions in 5- to 8-year-olds: Developmental changes and relationship to academic achievement. *Journal of Educational and Developmental Psychology*, 3(2), p153.

Rubie-Davies, C. M., Flint, A. & McDonald, L. G. (2012) 'Teacher beliefs, teacher characteristics, and school contextual factors: what are the relationships?*' British Journal of Educational Psychology*, 82, pp. 270–88.

Ryan, S. M., & Ollendick, T. H. (2018). The interaction between child behavioral inhibition and parenting behaviors: Effects on internalizing and externalizing symptomology. *Clinical Child and Family Psychology Review*, 21(3), 320–339.

Salimpoor, V. N., & Desrocher, M. (2006). Increasing the utility of EF assessment of executive function in children. *Developmental Disabilities Bulletin*, 34(1), 28.

Sawyer, C., Adrian, J., Bakeman, R., Fuller, M., & Akshoomoff, N. (2021). Self-regulation task in young school age children born preterm: Correlation with early academic achievement. *Early Human Development*, 157, 105362.

Sciutto, M.J., Terjesen, M.D., Frank, A.B. (2000) Teachers' knowledge and misperceptions of attention-deficit/hyperactivity disorder. *Psychology in the Schools*, 37(2), 115-122.

Sciutto, M. J., Nolfi, C. J., & Bluhm, C. (2004). Effects of child gender and symptom type on referrals for ADHD by elementary school teachers. *Journal of Emotional and Behavioral Disorders,* 12(4), 247–253.

Sciutto, M. J., Terjesen, M. D., Kučerová, A., Michalová, Z., Schmiedeler, S., Antonopoulou, K., Shaker, N. Z., Lee, J., Alkahtani, K., Drake, B., & Rossouw, J. (2016). Cross-national comparisons of teachers' knowledge and misconceptions of ADHD. *International Perspectives in Psychology: Research, Practice, Consultation*, 5(1), 34–50.

Schutter, D. J. L. G., van Bokhoven, I., Vanderschuren, L. J. M. J., Lochman, J. E., & Matthys, W. (2011). Risky decision making in substance dependent adolescents with a disruptive behavior disorder. *Journal of Abnormal Child Psychology*, 39(3), 333–339.

Shah, R., Das, A., Desai, I. & Tiwari, A. (2016). Teachers concerns about inclusive education in Ahmadabad, India.' *Journal of Research in Special Educational Needs*, 16, pp. 34–45.

Sherman, J., Rasmussen, C., & Baydala, L. (2008). The impact of teacher factors on achievement and behavioral outcomes of children with Attention Deficit/Hyperactivity Disorder (ADHD): A review of the literature. *Educational Research*, 50(4), 347–360. disorder. *Journal of Abnormal Child Psychology,* 39(3), 333–339.

Singh, I. (2011). A disorder of anger and aggression: Children's perspectives on attention deficit/hyperactivity disorder in the UK. *Social, Science, & Medicine*, 73, 889-896.

Stormont, M., Lewis, T.R., & Covington, S. (2005). Behavior support strategies in early childhood settings: Teachers' importance and feasibility ratings. *Journal of Positive Behavior Interventions*, 7, 131-139

Stormont, M., Reinke, W., Herman, K. (2011) Teachers' characteristics and ratings for evidence-based behavioral interventions. *Behavioral Disorders,* 37(1): 19-29.

Strelow, A.E.; Dort, M.; Schwinger, M.; Christiansen, H. (2021) Influences on Teachers' Intention to Apply Classroom Management Strategies for Students with ADHD: A Model Analysis. *Sustainability,* 13, 2558.

Syed, E.H., Hussein S.A. (2010) Increase in teacher knowledge about ADHD after a week-long training program: A pilot study. Journal of Attention Disorders, 13(4), 420-423.

Tahıllıoğlu, A., Bilaç, Ö., Uysal, T., & Ercan, E. S. (2021). Who predict ADHD with better diagnostic accuracy?: Parents or teachers? *Nordic Journal of Psychiatry*, 75(3), 214–223.

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, 72(2), 271–324.

Tannock, R., & Martinussen, R. (2001). Reconceptualizing ADHD. *Educational Leadership*, 59, 1–6.

Tiwari, A., Das, A. K. & Sharma, M. (2015). Inclusive education a "rhetoric" or "reality"? Teachers' perspectives and beliefs. *Teaching and Teacher Education*, 52, pp. 128–36.

Topkin, B. & Roman, N.V. (2015) Attention Deficit Disorder (ADHD): Primary school teachers' knowledge of symptoms' treatment and managing classroom behavior. *South African Journal of Education*, 35(2), 1-8.

Trout, A. L., Lienemann, T. O., Reid, R., & Epstein, M. H. (2007). A review of non-medication interventions to improve the academic performance of children and youth with ADHD. *Remedial and Special Education*, 28(4), 207-226

Tschannen- Moran, M., & Woolfolk Hoy, A. (2001) Teacher efficacy: capturing an elusive construct. *Teaching and Teacher Education*, 17, 783-805.

Turnbull, R., Turnbull, A., Shank, M., and Smith, S. J. (2004) Exceptional Lives: Special Education in Today's Schools. Prentice Hall PTR.

Tyre, A.D., Feuerborn, L.L., Woods, L. (2018) Staff Concerns in Schools Planning for and Implementing School-Wide Positive Behavior Interventions and Supports. *Contemporary School Psychology,* 22:77-89.

Veenman, B., Luman M., Oosterlaann, J. (2017) Further insight into the effectiveness of a behavioral teacher program targeting ADHD symptoms using actigraphy, classroom observations and peer ratings. *Frontiers in Psychology,* (8) 1157.

Vereb, R. L., & DiPerna, J.C. (2004) Teachers' knowledge of ADHD, treatments for ADHD, and treatment acceptability: An initial investigation, *School Psychology Review*, 33(3), 128.

Vile Junod, R. E., DuPaul, G. J., Jitendra, A. K., Volpe, R. J., & Cleary, K. S. (2006). Classroom observations of students with and without ADHD: Differences across types of engagement. *Journal of School Psychology*, 44(2), 87–104.

Wakschlag, L. S., Choi, S. W., Carter, A. S., Hullsiek, H., Burns, J., McCarthy, K., Leibenluft, E., & Briggs-Gowan, M. J. (2012). Defining the developmental parameters of temper loss in early childhood: Implications for developmental psychopathology: Early childhood parameters of temper loss. *Journal of Child Psychology and Psychiatry*, 53(11), 1099–1108.

Walensky, R.P., Houry, D., Jernigan, D.B., et al. (2022) Mental health surveillance among children- united states, 2013, 2019. MMWR Suppl 2022;71.

Wang, F. L., Galán, C. A., Lemery-Chalfant, K., Wilson, M. N., & Shaw, D. S. (2020). Evidence for two genetically distinct pathways to co-occurring internalizing and externalizing problems in adolescence characterized by negative affectivity or behavioral inhibition. *Journal of Abnormal Psychology*, 129(6), 633–645.

Wang, Y., & Zhou, X. (2019). Longitudinal relations between executive function and internalizing problems in grade school: The role of peer difficulty and academic performance. *Developmental Psychology*, 55(10), 2147–2158.

Ward, R.J., Bristow, S.J., Kovshoff, H., Cortese, S., Kreppner, J. (2022) The effects of ADHD teacher training programs on teachers and pupils: A systematic review and meta-analysis. *Journal of Attention Disorders*, 26(2): 225-244.

Webb, M. B., Johnson, E. S., Meek, J., Herzog, B., & Clohessy, A. B. (2018). Developing a school-based multitiered model for self-regulation. *Intervention in School and Clinic*, 53(5), 300–307.

Wiener, J. (2020). The Role of School Psychologists in Supporting Adolescents With ADHD. *Canadian Journal of School Psychology*, 35(4), 299-310.

Witt, J. C., Martens, B. K. & Elliott, S. N. (1984) Factors affecting teachers' judgments of the acceptability of behavioral interventions: Time involvement, behavior problem severity, and type of intervention. *Behavior Therapy*. 15(2): 204-209.

Wilkey, E. D., Pollack, C., & Price, G. R. (2020). Dyscalculia and typical math achievement are associated with individual differences in number-specific executive function. *Child Development*, 91(2), 596–619.

Woodward, L. J., Lu, Z., Morris, A. R., & Healey, D. M. (2017). Preschool self regulation predicts later mental health and educational achievement in very preterm and typically developing children. *The Clinical Neuropsychologist,* 31(2), 404–422.

Yang, Y., Shields, G. S., Zhang, Y., Wu, H., Chen, H., & Romer, A. L. (2022). Child executive function and future externalizing and internalizing problems: A meta-analysis of prospective longitudinal studies. *Clinical Psychology Review,* 97, 102194.

Young, S. E., Friedman, N. P., Miyake, A., Willcutt, E. G., Corley, R. P., Haberstick, B. C., & Hewitt, J. K. (2009). Behavioral disinhibition: Liability for externalizing spectrum disorders and its genetic and environmental relation to response inhibition across adolescence. *Journal of Abnormal Psychology,* 118(1), 117–130.

Youssef, M., Hutchinson, G., Youssef, F.F. (2015) Knowledge of an attitudes towards ADHD among teachers: Insights form a Caribbean nation. *Sage Open,* 5(1).

Zee, M., & Koomen, H. M. Y. (2016). Teacher self-efficacy and its effects on classroom processes, student academic adjustment, and teacher well-being: A synthesis of 40 years of research. *Review of Educational Research*, 86(4), 981–1015.

Zee, M., de Jong, P.F., Koomen H.M.Y. (2017) From externalizing student behavior to student-specific teacher self-efficacy: The role of teacher-perceived conflict and closeness in the student–teacher relationship. Contemporary Educational Psychology (51): 37-50.

Zelazo, P. D., Muller, U., Frye, D., & Marcovitch, S. (2003). The development of executive function in early childhood. *Monographs of the Society for Research in Child Development,* 68(3), vii–viii.

Zendarski, N., Haebich, K., Bhide, S., Quek, J., Nicholson, J. M., Jacobs, K. E., Efron, D., & Sciberras, E. (2020). Student–teacher relationship quality in children with and without ADHD: A cross- sectional community-based study. *Early Childhood Research Quarterly*, 51, 275–284.

Zentall, S. S., & Javorsky, J. (2007). Professional development for teachers of students with ADHD and characteristics of ADHD. *Behavioral Disorders*, 32(2), 78–93.

Ziermans, T., Dumontheil, I., Roggeman, C., Peyrard-Janvid, M., Matsson, H., Kere, J., & Klingberg, T. (2012). Working memory brain activity and capacity link MAOA polymorphism to aggressive behavior during development. *Translational Psychiatry*, 2(2), e85–e85.

Zipke, M., Ingle Carey, J., & Moorehead, T. (2019) The effects of modeling the use of technology with pre-service teachers. *Computers in the Schools.* 36(3): 205-221.