



What Do Preschool Teachers Know About Attention-Deficit/Hyperactivity Disorder (ADHD) and Does It Impact Ratings of Child Impairment?

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Abstract

Among preschool children referred for psychological assessment and intervention, attention-deficit/hyperactivity disorder (ADHD) is the most commonly diagnosed disorder. In order to create school-based interventions that are consistently and effectively implemented by teachers, it is important to understand teachers' knowledge and beliefs about ADHD, as studies have identified lack of knowledge as a barrier to treatment integrity. The present study seeks to fill the important gaps of previous work and gain an understanding of preschool teachers' knowledge and opinions of ADHD, and how knowledge of ADHD impacts teachers' perceptions of child impairment across domains. The present study includes teachers ($n = 107$; 97.2% female; 59.2% Hispanic or Latino; 16.8% Black or African-American) of ethnically and linguistically diverse preschool students in an urban school setting who were being referred for a summer treatment program. Teachers' knowledge of ADHD was investigated and related to teacher characteristics (i.e., education, years of experience, classroom type, professional development) and ratings of child impairment across domains. Overall, preschool teachers achieved 38.3% accuracy on the knowledge of ADHD measure, with highest levels of inaccurate knowledge related to the symptoms and treatment for ADHD. Generally, teachers with more misperceptions and knowledge gaps regarding ADHD rated children as more impaired on several domains. The results of the current study reveal large gaps in preschool teacher knowledge of ADHD. As such, there are important implications for future teacher training and professional development.

Keywords ADHD · Preschool · Teacher knowledge · Preschool teacher

Introduction

Among preschool children referred for psychological assessment and intervention, attention-deficit/hyperactivity disorder (ADHD) is the most commonly diagnosed disorder (Egger & Angold, 2006; Gadow, DeVincent, Pomeroy, & Azizian, 2004; Lavigne, LeBailly, Hopkins, Gouze, & Binns, 2009; Wichstrom et al., 2011). Prevalence rates of ADHD in preschool samples indicate that approximately one child in every early childhood education setting has ADHD, similar to rates identified in elementary-age youth (Egger and Angold, 2006; Lavigne et al., 2009). ADHD symptoms in

the preschool years have been consistently linked to poor school readiness and pre-academic functioning (McClelland et al., 2007), continued problem behaviors and externalizing behavior diagnoses in elementary school (Angold & Egger, 2007; Campbell & Ewing, 1990), referrals for special education (Redden et al., 2003), academic failure (Masseti et al., 2008), negative relationships with teachers (Greene, Beszterczey, Katzenstein, Park, & Goring, 2002), poor social emotional skills and social relationships (Ros & Graziano, 2017), and higher levels of substance use and comorbid mental health concerns in adolescence and young adulthood (Biederman et al., 2006; Molina & Pelham, 2003; Shaw & Gilliam, 2017). Of critical concern, children are expelled from preschool at more than three times the rate of children in grades K-12 (Gilliam, 2005), suggesting that many early childhood educators may not be well equipped to effectively manage the behavioral challenges often associated with ADHD within the context of the preschool classroom. In the current paper, we will explore preschool teacher

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knowledge of ADHD as well as the impact of knowledge on teacher ratings of child impairment.

Teachers' Role in ADHD Intervention

The school setting inherently presents challenges for children with ADHD symptoms. The unique demands of school (e.g., waiting your turn, completing assignments/tasks, following directions, staying in a designated area) directly challenge the core deficits of ADHD. Preschool represents many children's earliest schooling experience and is often the first setting in which the problem behaviors associated with ADHD become apparent and impairing. Though the preschool environment typically involves more child-led activities (e.g., child-led center-based play) over the traditional teacher-led nature of elementary school classrooms, children are still expected to follow directions, attend to academic lessons, complete early academic work, transition appropriately between activities, and interact cooperatively with other children (Rimm-Kaufman & Pianta, 2000). Many children with ADHD noticeably struggle with these early school expectations and preschool teachers, therefore, are often the main referral source for children exhibiting ADHD symptomatology (DuPaul & Kern, 2011). It is necessary for teachers to accurately understand the causes and recognize the symptoms of ADHD to make treatment referrals that will benefit their students with early ADHD symptomatology. Additionally, to make relevant and effective referrals, an understanding of evidence-based treatments for the disorder is essential. The emergence of impairment associated with ADHD symptoms in the preschool setting, as well as the significant implications associated with negative early school experiences (e.g., Angold & Egger, 2007; Massetti et al., 2008; Shaw & Gilliam, 2017) indicate that preschool settings and preschool teachers may be an important target for early intervention, especially given that early intervention services come at an estimated societal economic benefit of \$8.70/intervention dollar (Heckman, 2000).

In addition to the important role played in effective referral, teachers are essential in the assessment, diagnosis, and development of intervention targets for children with ADHD. In comprehensive assessment of ADHD, teacher report is necessary, as a diagnosis requires the presence of symptoms and impairment across multiple settings (e.g., home and school; American Psychiatric Association, 2013). Diagnosing clinicians, therefore, assume accurate teacher report of symptoms and depend on teacher perceptions of child impairment to conceptualize children's ADHD diagnoses, which guides treatment planning. Relatedly, research on interventions for childhood ADHD suggests that parent and/or teacher delivered interventions are most effective as they serve to create clear and consistent environments. Of note, the combination of parent and teacher involvement in

ADHD interventions in elementary samples has been linked to the most generalized behavior change across multiple systematic reviews (Evans, Owens, & Bunford, 2014; Evans, Owens, Wymbs, & Ray, 2018; Pelham & Fabiano, 2008). Importantly, these classroom focused interventions utilize the teacher both as the main reporter of children's in-school behavior, and as the agent of implementation. Thus, understanding factors that may relate to perceptions of student symptoms and ratings of impairment is essential, as teacher input is primary in the development and execution of intervention targets.

Importance of Teacher Knowledge and Perceptions in Effective Intervention

There is considerable evidence for the positive impact of classroom-based interventions for ADHD in school-age youth (e.g., Evans et al., 2018), and growing evidence to support similarly positive behavioral outcomes for preschool students (DuPaul & Kern, 2011; McGoe, Eckert & DuPaul, 2002; Webster-Stratton, Reid, & Beauchaine, 2013). Again, these interventions rely on the teacher to guide targets and implementation. The Daily Report Card (DRC), for example, is an evidence-based intervention tool that, when executed correctly, has been shown to significantly improve children's behavioral functioning (Owens et al., 2012; Volpe & Fabiano, 2013). However, as Owens et al. (2012) have found, effective implementation of the DRC can be complex, and requires appropriate identification of problem behaviors, conceptualization of the function of the behavior, knowledge of how to target the behavior, and, most importantly, consistent labeling and feedback surrounding the behavior. Such evidence-based interventions are often challenging for teachers to execute and are, therefore, underutilized in the classroom setting (Martinussen, Tannock, & Chaban, 2011), especially in preschool.

Studies have found that in addition to concerns of feasibility, effective teacher implementation is directly impacted by lack of teacher understanding and knowledge, lack of teacher skills, and teacher perceptions of children's behavioral concerns (Coles, Owens, Serrano, Slavec, & Evans, 2015; Noell, Witt, Gilbertson, Ranier, & Freeland, 1997; Owens et al., 2017; Sanetti & Kratochwill, 2009). Adult learning theory highlights knowledge as a key domain necessary for understanding and utilizing strategies related to behavioral health (Stuart, Tondora, & Hoge, 2004). As such, studies of comprehensive teacher consultation models have targeted both teacher knowledge and perceptions. Teachers who have low knowledge and interfering beliefs prior to intervention differentially benefit from a consultation model that includes targets to enhance knowledge and shift perceptions, when compared to standard consultation services (Owens et al., 2017). Therefore, both knowledge and perceptions may be

malleable barriers to intervention implementation. Importantly, low intervention integrity and teacher skills, impacted by teacher knowledge and beliefs, hinders students' achievement of positive intervention outcomes (Durlak & DuPre, 2008; Owens et al., 2020). As such, understanding preschool teachers' knowledge of ADHD, and the impact of knowledge on their perceptions of students with ADHD, may be key steps to enhancing intervention integrity for young children with ADHD, and thereby, positive intervention outcomes.

Teacher Knowledge and Perceptions of ADHD

Teacher knowledge of ADHD, as defined in the current investigation, refers to understanding of the symptoms of ADHD, effective treatments for ADHD, and other general information about ADHD including causes and prevalence. Studies that examine teacher knowledge of ADHD in elementary and preservice teacher samples are varied in their findings, and report that teachers' accuracy rate is as low as 47.8% and 49% (Poznanski, Hart, & Cramer, 2018; Sciutto, Terjesen, & Bender-Frank, 2000) and as high as 77.5% (Jerome, Washington, Laine, & Segal, 1999) on respective measures of ADHD knowledge. The variation of study findings may be attributed to different measurement tools and features assessed, as knowledge questionnaires with more items and inclusion of a "don't know" response option typically yield fewer correct responses (Kos, Richdale, & Hay, 2006). Still, there are a number of misperceptions of ADHD highlighted in the literature, with consensus that some of the most common misconceptions endorsed by teachers are related to dietary causes and/or treatments for ADHD (Jerome et al., 1999; Kos et al., 2006; Poznanski et al., 2018; Sciutto et al., 2000). Studies that have addressed teacher knowledge of ADHD have also identified that teachers with more years of teaching experience, experience in special education classrooms, or reported experience with children with ADHD typically achieve higher accuracy scores (Anderson, Watt, Noble, & Shanly, 2012; Bekle, 2004; Kos, Richdale, & Jackson 2004).

There is also an important connection between teacher knowledge and perceptions and their behaviors toward students with ADHD. That is, teachers with greater ADHD knowledge typically have more positive perceptions of the disorder (Bekle, 2004), are more likely to encourage parents to seek outside help for the child (Ohan, Cormier, Hepp, Visser & Strain, 2008), and are more willing to make classroom adaptations for the child (Ohan, Visser, Strain, & Allen, 2011). Yet, these teachers often report having less confidence in their ability to instruct the child and report higher levels of expected disruption in the classroom (Ohan et al., 2008; 2011). Similarly, teachers with more years of experience have been found to have less favorable affect, measured qualitatively, toward children with ADHD (Anderson

et al., 2012). Additionally, evidence suggests that teacher positive perceptions about their students with ADHD, particularly perceptions of a positive relationship, may serve as a protective factor against poor school outcomes for students with ADHD (Hamre & Pianta, 2001; Rushton, Giallo, & Efron, 2020). Therefore, understanding the impact of ADHD knowledge on preschool teachers perception of child impairment may serve to enhance intervention planning and implementation, and ultimately young students' outcomes.

It is also important to highlight that teachers report a lack of knowledge and skills necessary to address the mental health needs of their students, with one study indicating only 28% of early childhood and elementary teachers agree that they possess appropriate knowledge, and 34% agree that they have the needed skills (Reinke, Stormont, Herman, Puri, & Goel, 2011). In preservice samples, work has additionally identified a lack of knowledge in appropriate classroom management strategies for children with behavioral difficulties, with the highest misperceptions found for skills related to managing attention problems and other disruptive behaviors in the classroom (Poznanski et al., 2018). Therefore, the literature to date provides good insight into the need for more training and education about ADHD, and more specifically, training teachers in information about tools and skills that address the needs of students with ADHD.

Despite the similarly high prevalence of ADHD in preschool classrooms and the promise of early intervention, teacher knowledge and perceptions of ADHD have not been nearly as extensively examined among preschool teachers. Preschool teachers are a unique and distinctly different population of educators when compared to elementary school teachers, which warrants independent investigation. Firstly, the education and experience level of preschool teachers is more highly varied than elementary school teachers. Across the USA, preschool teachers' minimum education requirements range by state from a high school diploma, with an early childhood credential (e.g., the Child Development Associate Credential), to Associate and Bachelor's degrees depending on the early childhood educational setting. Conversely, elementary school teachers uniformly are required to have a Bachelor's degree (U.S. Department of Labor, 2019) and meet specified state certification requirements. Many children across the country are enrolled in private preschool or daycare centers, too, for which training level is often unstandardized, as are professional development requirements (U.S. Department of Labor, 2019). Due to the discrepancy in education level, as well as the importance of early identification of and intervention for children with ADHD, preschool teachers are an exceedingly important population to study.

The only study, to our knowledge, that has examined preschool teachers' types of education experiences, knowledge, and opinions related to ADHD (Stormont & Stebbins,

2005), was conducted in a sample of 138 primarily Caucasian (82%) teachers with some level of college or graduate education (83%). The study identified that magazines were the most common source of information regarding ADHD, and in their sample of teachers, most possessed primarily accurate knowledge, but some important misconceptions were still endorsed (e.g., EEGs can accurately assess for ADHD). In this study, level of education was associated with higher knowledge scores, but teachers' perceptions of their knowledge (e.g., little to no knowledge, moderate to extensive knowledge) did not have any relationship to actual knowledge, indicating that preschool teachers may be unaware of knowledge deficits. Similarly, most preschool teachers endorsed that they had a difficult time identifying children with ADHD (77%) and did not understand how ADHD is assessed (65%; Stormont & Stebbins, 2005). This preliminary investigation of preschool teachers' knowledge of ADHD provides a good initial look at this teaching population and has implications for intervention and practice. Still, the generalizability of the findings is limited in that the study was conducted among an educated Caucasian sample of teachers living in one mid-sized community.

The Current Study

The current study seeks to fill the gaps of previous research and better understand the scope of preschool teachers' knowledge and opinions of ADHD symptoms, causes, and treatments and how knowledge of ADHD relates to perceptions of child impairment on various domains (e.g., peer relationships, classroom disruption, relationship with teacher) in a sample of teachers who serve culturally and linguistically diverse urban students and who are culturally and linguistically diverse themselves. Examining these constructs within this population is especially important given the growing trends in the USA, as Latinx children represent 26% of the population entering kindergarten (Ryan & Bauman, 2016). Much of the current literature is not representative of the population, and studies have primarily been conducted in Caucasian, middle- to high-income samples. Further, children from culturally and linguistically diverse backgrounds are at an even greater risk of adverse outcomes associated with ADHD diagnoses (e.g., expulsion, poor academic trajectory; Gutman, Sameroff, & Cole, 2003; Mistry et al., 2008), and there is evidence that preschool teacher biases, related to race and sex, are associated with their behavioral expectations for children (Gilliam, Maupin, Reyes, Accavitti, & Shic, 2016). Moreover, the study is unique in that it relates teacher knowledge of ADHD to important aspects of child outcomes (i.e., teacher perceptions of child impairment). Therefore, the current study aims to (a) understand preschool teachers' typical knowledge about ADHD including knowledge about general information, treatments, and

symptoms of ADHD; (b) understand how teacher characteristics (e.g., years teaching, education level, professional development experiences, type of classroom) are related to knowledge of ADHD; and (c) identify the extent to which teachers' knowledge of ADHD impact their perceptions of student impairment across domains (i.e., peer relationships, student–teacher relationship, academics, self-esteem, classroom functioning, overall need for treatment) in a sample of treatment-seeking preschool children. The first aim is exploratory, as little is known about preschool teacher knowledge of ADHD. As identified in the previous literature, though, it is expected that preschool teachers will report greater misperceptions and lack of knowledge in the symptoms and treatment domains, when compared to general information about ADHD (Poznanski et al., 2018). For the second aim, we expect that those teachers with more teaching, education, professional development experience, and special education classroom experience will have greater knowledge of ADHD, as found in previous work (e.g., Anderson et al., 2012). Though knowledge as related to teacher ratings of impairment has not been investigated, given previous literature that has examined teacher perceptions of students with ADHD in relation to knowledge (Ohan et al., 2008), we hypothesize that teachers who have greater knowledge of ADHD will rate children as more impaired across domains of functioning and more in need of treatment due to better understanding of the disorder.

Methods

Participants and Recruitment

The participating sample consisted of 107 preschool teachers (97.2% female; 59.2% Hispanic or Latino; 16.8% Black or African-American) of ethnically diverse (69.6% Hispanic or Latino; 20.3% Black or African-American) students who presented for treatment in a summer treatment program for pre-kindergarteners with externalizing behavior problems (Graziano, Slavec, Hart, Garcia, & Pelham 2014) from 2015 to 2018. The summer program took place in two locations in a large urban southeastern city in the USA with a considerably large Hispanic (69.1%) and Black population (17.9%; U.S. Census Bureau, 2019). The children were recruited from local schools, via brochures, radio advertisements, newspaper advertisements, mental health centers, and open houses/parent workshops. In order to participate in the treatment program, children were required to have a score of 60 or above on the parent or teacher Behavioral Assessment Scale for Children, 2nd Edition (BASC-2) or BASC-3 (Reynolds & Kamphaus 2004), be enrolled in preschool during the previous year, have an estimated IQ of 65 or higher, be proficient in English, and be able to attend the

treatment program. Once the children were enrolled, measures were collected from parents and preschool teachers of the participants in the academic year prior to beginning the summer program. Please see Table 1 for additional demographic information for participating children and teachers. All participating teachers were instructing in English and completed the questionnaires in English.

Study Design and Procedure

The study was approved by the university's Institutional Review Board. The measures analyzed in the current study were completed as part of a single time point battery given to teachers of study participants prior to the start of the treatment program. Surveys were completed either with paper and pencil questionnaires or via an online survey platform, REDCap or Qualtrics. Teachers received \$25 gift cards for

completion of the larger battery of questionnaires about their referred student. Teachers completed the ADHD knowledge questionnaire as part of a demographic survey section that was given in conjunction with the larger battery of questionnaires for the first student from their class who was referred to the program. Therefore, if a teacher had more than one student who participated in the summer program, the first student for whom the teacher completed the larger battery of questionnaires was used in analyses. For example, if a teacher had multiple students in their classroom, either in a given year or across the years of data collection, who were referred for the program, the first student for whom teachers completed questionnaires was used in analyses, as their student ratings were most proximal to the knowledge measure.

Measures

Demographic Questionnaire

Demographic information was collected as part of a larger battery completed by teachers. The demographic questionnaire included questions about gender, number of years teaching, class size, teacher to student ratio, class type (e.g., general education, special education), and number of in-service or professional development hours spent focused on ADHD in the past 5 years. The demographic information relevant to the analyses is represented in Table 1.

Knowledge of ADHD

Knowledge of ADHD was measured using the Knowledge and Opinion of ADHD scale (KOAD; Poznanski et al., 2018). The KOAD consists of 19 knowledge items (e.g., "There are a greater number of boys than girls with ADHD"; rated True, False, Don't Know) and 4 opinion items (e.g., "I believe medication could help my student with ADHD"; rated on a 6-point Likert-type scale from Strongly Agree to Strongly Disagree). Only the knowledge items were used in the present analyses. The scale was modified from the ADHD Knowledge and Opinion Survey-Revised (AKOS-R; Bennett, Power, Rostain, & Carr, 1996; Rostain, Power, & Atkins, 1993) and the Knowledge and Beliefs Questionnaire (Kos et al., 2004). The present scale includes both positively and negatively framed items in order to assess teachers' ability to accurately recognize what ADHD is and is not. The measure includes three subscales which represent various domains of ADHD knowledge including: General Information, which includes knowledge of the nature and causes of ADHD (7 items), Symptoms, which includes information about recognizing symptoms of ADHD (4 items), and Treatment, which includes items related to knowledge of treatments for ADHD (8 items). The rates of correct responses (*accurate knowledge of ADHD*), incorrect responses

Table 1 Teacher and child demographic variables

	Total sample (<i>n</i> = 107)
<i>Child demographic variables</i>	
Child sex (% male)	70.1
Child race/ethnicity (%)	
Hispanic/Latino	69.6
Non-Hispanic/Latino White	7.6
Black or African-American	20.3
Child diagnoses (%)	
ADHD present	89.8
ODD present	82.2
CD present	28.3
Other	1.3
Presence of comorbidity (%)	74.4
<i>Teacher demographic variables</i>	
Teacher sex (% female)	98.1
Teacher race/ethnicity (%)	
Hispanic/Latino	59.2
Non-Hispanic/Latino	12.2
Black or African-American	16.8
Other	5.2
Highest level of education (%)	
High school diploma or equivalent	3.8
Some college/Associates degree	19.2
College graduate (bachelor's degree)	50.0
Advanced degree (masters, MBA, Ph.D., JD)	26.9
Type of classroom (%)	
General education	65.2
Special education	34.7
Years of experience (mean)	15.08
Hours of professional development in last 5 years (mean)	16.27

(*misperceptions* of ADHD), and don't know responses (*lack of knowledge* of ADHD) on the overall measure and across each subscale were utilized for analyses. Confirmatory factor analyses in previous studies demonstrate adequate fit of the three subscales and good reliability and validity of the measure ($\alpha=0.73$; Poznanski et al., 2018). Similarly, high reliability was found in the current sample for the overall measure ($\alpha=0.92$), and across the three subscales (α 's = 0.78–0.84).

Impairment Rating Scale

To assess teachers' ratings of child impairment, teachers completed the Impairment Rating Scale for Teachers (IRS-T; Fabiano et al., 2006). The IRS-T is a 7-item scale that demonstrates good concurrent, convergent, and discriminant validity. The scale asks teachers to rate how much the child's problems affect peer relationships, the relationship with the teacher, the child's academic progress, the classroom in general, and the child's self-esteem. Finally, the teacher is asked the overall severity of the child's problem and their need for treatment. All questions are rated on a 7-point scale ranging from 0 (*No Problem*) to 6 (*Extreme Problem*). A score of 3 or more on any of the items suggests clinical impairment. This measure demonstrates good concurrent, convergent, and discriminant validity (Fabiano et al., 2006) and good reliability in the current sample ($\alpha=0.97$).

Analytic Plan

In order to address study aims, correct response percentages, incorrect response percentages, and "don't know" response percentages were calculated for each of the items on the KOAD, as well as all items together for a total score. Additionally, the response percentages for each category (i.e., correct, incorrect, don't know) were calculated for each of the three knowledge subscales (i.e., General Information, Symptoms, Treatment).

To address the first research question, the correct responses for each item on the KOAD were examined descriptively for a total *accuracy* rate (percent of correct answers), *misperception* rate (percent of incorrect answers), and *lack of knowledge* rate (percent of "don't know" responses). Each of the subscales was also examined descriptively in order to understand *accuracy*, *misperceptions*, and *lack of knowledge* across subscales. Within-subjects ANOVAs were then conducted to understand the difference in *accuracy*, *lack of knowledge*, and *misperceptions* for each of the domains of the KOAD. To address the second study aim, overall correct, incorrect, and "don't know" response percentages of the KOAD and each of the subscales, hours of outside training, years of experience, education level, and type of classroom (i.e., general or special education) were all

examined via correlation analyses, and subsequently investigated using regression analyses. Correlations were conducted in Mplus utilizing a weighted least square mean and variance adjusted (WLSMV) estimator in order to account for the different types of variables (i.e., continuous, ordinal, binary) utilized in the present study (Muthén & Muthén, 1998–2010). Using this method, appropriate correlation analyses (e.g., Pearson, biserial, polychoric) are conducted in Mplus depending on the types of variables included. For regressions, two models were estimated in Mplus, each containing a series of regression equations. The first model examined the relationship between each of the overall KOAD response categories (i.e., overall *accuracy*, overall *lack of knowledge*, and overall *misperceptions*) and teacher demographic characteristics (i.e., professional development, education, years of experience, class type), with demographic characteristics entered as predictor variables. The second model estimated the relationship between each of the response categories on the KOAD subscales (e.g., General Information *accuracy*, General Information *misperception*, General Information *lack of knowledge*) and the aforementioned demographic variables, entered as predictors. To address the final study aim, initial correlations were conducted between teachers overall KOAD scores and ratings of child impairment across domains (i.e., peer relationships, teacher relationship, academics, self-esteem, classroom functioning, global functioning) with the WLSMV estimator as described above (Muthén & Muthén, 1998–2010). Relationships were investigated further using regression analyses, all controlling for teacher years of experience, professional development, education, and classroom type. Here, four additional models were estimated in Mplus, each containing a series of regression equations. The first examined each IRS domain in relation to overall KOAD response categories (i.e., *accuracy*, *misperceptions*, *lack of knowledge*) controlling for teacher demographics (i.e., teacher years of experience, professional development, education, classroom type), the second examined each IRS domain in relation to KOAD response categories on the General Information subscale controlling for teacher demographics, the third examined each IRS domain in relation to the Treatment subscale controlling for teacher demographics, and the fourth examined each IRS domain in relation to the Symptoms subscale controlling for teacher demographics. Analyses were conducted in SPSS and Mplus. Prior to conducting analyses, distribution statistics (i.e., range, skewness, kurtosis) were examined along with visual histogram inspection to understand normality. All variables had acceptable skewness and kurtosis (~ 1), representing normal distribution aside from the overall *lack of knowledge* percentage of the KOAD, and the *lack of knowledge* percentage for the Symptoms, General Information, and Treatment subscales. The non-normality seems to be due to zero-inflation, as many teachers answered

either “true” or “false” and did not utilize the “don’t know” option. Therefore, in regression analyses, we used maximum likelihood with robust standard errors (MLR) estimation (Lai, 2018; Muthén & Muthén, 1998–2010). Additionally, approximately 8% of teachers did not have concurrent child ratings of impairment. Therefore, all analyses were conducted utilizing full information maximum likelihood to account for missing data. Both standardized and unstandardized regression coefficients are reported and interpreted to understand regression effects. Additionally, Cohen’s f^2 is interpreted according to guidelines for small (0.02), medium (0.15), and large (0.35) effect sizes (Cohen, 1988).

Results

Knowledge of ADHD

To address the first study aim, responses for the KOAD were examined descriptively. On average, teachers achieved 38.3% (SD = 13.2) overall *accuracy* on the KOAD. Additionally, teachers reported that they did not know 9.8% (SD = 12.5) of KOAD items, and incorrectly

answered an average of 34.3% (SD = 12.0) of KOAD items, indicating *misperceptions* on just over a third of ADHD facts. Item by item descriptive statistics for the KOAD are represented in Table 2. As displayed in the table, the most common accurately answered item on the KOAD was related to an understanding that changes in classroom management *can* improve the *behavior* of children with ADHD, with 89.7% of preschool teachers answering correctly. Conversely, the most common misperception endorsed by teachers was that changes in classroom management *cannot* improve the *academic performance* for children with ADHD with 89.7% of teachers endorsing this misperception. Other common *misperceptions* include 72% of teachers believing that individual counseling *is* an effective treatment for ADHD, and 78.5% of teachers incorrectly believing that parents *need* to be involved in treatment for classroom interventions to be effective. Other common *misperceptions* include a belief that diets are an effective treatment for ADHD (44.9%). The most common area in which teachers reported a lack of knowledge was in regard to the prevalence rate of ADHD, with 20.6% of preschool teachers reporting that they did not know whether the answer was true or false.

Table 2 Knowledge and opinion of ADHD: response percentages by subscale

Item	% correct (% don't know)
<i>General Information subscale</i>	
The cause of ADHD is unknown	39.3 (15.9)
Approximately 5% of school-aged children have ADHD	39.3 (20.6)
ADHD is often caused by food additives	43.9 (12.1)
ADHD children are born with biological vulnerabilities toward inattention and poor self-control	40.2 (16.8)
ADHD can be inherited	58.9 (11.2)
There is approximately 1 child in every classroom with a diagnosis of ADHD	59.8 (12.1)
There are a greater number of boys than girls with ADHD	66.4 (11.2)
<i>Treatment subscale</i>	
Diets are usually not helpful in treating most children with ADHD	15.0 (7.5)
Individual counseling is an effective treatment for ADHD	6.5 (13.1)
If parents are not involved in a child's treatment, a classroom intervention is not likely to be effective	9.3 (4.7)
Children with ADHD always need a quiet environment to concentrate	32.7 (7.5)
It is most effective to use medication <i>before</i> implementing a behavioral classroom intervention for ADHD	48.6 (7.5)
If medication is prescribed, educational interventions are often unnecessary	33.6 (7.5)
Changes in classroom management can significantly improve academic performance for children with ADHD	6.5 (1.9)
Changes in classroom management can significantly improve the behavior of children with ADHD	89.7 (2.8)
<i>Symptoms Subscale</i>	
A child who is not overactive, but fails to pay attention, may have ADHD	44.9 (7.5)
Children with ADHD cannot sit still long enough to pay attention	13.1 (6.5)
Some children with ADHD are not hyperactive or impulsive	47.7 (5.6)
If a child performs better when taking a stimulant medication (e.g., Ritalin) then they probably have ADHD	32.7 (15.0)
Overall Score	38.3 (9.8)

Comparison Across General Information, Treatment, and Symptoms Subscales

In order to understand the differences in knowledge, further, differences in mean scores across subscales were analyzed using within-subjects ANOVA. The differences in teachers' *accurate knowledge*, *lack of knowledge*, and *misperceptions* were investigated for each of the subscales. Comparison analyses reveal significant differences, with a large effect size, in preschool teachers' *accurate knowledge* rate across subscales $F(1.9, 201.9) = 24.8, p < 0.001, \eta_p^2 = 0.19$. Post hoc analyses using Bonferroni correction indicate that teachers' *accurate knowledge* of General Information about ADHD was, on average, nearly 20 percentage points higher than their *accurate knowledge* of Treatments of ADHD, $p < 0.001$, and approximately 15 percentage points higher than their *accurate knowledge* of Symptoms of ADHD, $p < 0.001$. There were no significant differences in the average *accuracy* rates on Symptoms and Treatment subscales. There were also significant differences, with a moderate effect size, in teachers' *lack of knowledge* across subscales, $F(1.9, 211.9) = 10.96, p < 0.001, \eta_p^2 = 0.09$, in that teachers' *lack of knowledge* was highest on the General Information subscale. Specifically, rates of *lack of knowledge* on the General Information subscale were about 8 percentage points higher than the Treatment scale, $p < 0.001$, and about 6 percentage points higher than the Symptoms subscale, $p < 0.01$. Yet, there were no differences in *lack of knowledge* between the Symptoms and Treatment subscales. Finally, investigation of differences in average rates of *misperceptions* revealed significant differences, with a large effect size, across subscales, $F(1.7, 184.6) = 37.36, p < 0.001, \eta_p^2 = 0.26$. Post hoc analyses with Bonferroni correction revealed significant differences across each of the subscales, with greater *misperception* rates on the Treatment subscale when compared to both the General Information, $p < 0.001$, and the Symptoms subscale, $p = 0.001$. Specifically, teachers had nearly 25% higher rates of *misperceptions* on the Treatment subscale than the General Information subscale, and nearly 10% higher rates of *misperceptions* on the Treatment subscale than the Symptoms subscale. Analyses also reveal that teachers' rates of *misperceptions* on the General Information subscale were also significantly lower, approximately 15 percentage points, than the Symptoms subscale, $p < 0.001$.

Teacher Characteristics and ADHD Knowledge

Initial correlations were conducted to understand relationships between KOAD responses and teacher characteristics (i.e., education, hours of professional development, years of experience, type of classroom). Correlations are represented in Table 3. Importantly, though no significant correlations were identified, relationships were investigated utilizing

regression analyses, to understand potential cooperative suppression effects, given the opposing nature of our knowledge outcomes (e.g., *accuracy* vs. *misperception*; Watson, Clark, Chmielewski, & Kotov, 2013). Of note, regression analyses revealed that professional development was significantly related to *lack of knowledge* (i.e., "don't know" response rate), such that teachers with fewer hours of professional development had significantly greater rates of *lack of knowledge* on the KOAD, $B = -0.001, p < 0.01, \beta = -0.19$. The effect size for the regression model represents a small effect ($f^2 = 0.06; R^2 = 0.06$). No other teacher characteristics were related to teachers' overall responses on the KOAD.

Teacher Characteristics and General Information about ADHD

In investigation of the relationship between teacher characteristics and response rates on the General Information subscale via regression analyses, hours of professional development were significantly related to *accuracy* rates. That is, preschool teachers with more hours of professional development had more accurate knowledge related to General Information about ADHD ($B = 0.002, p < 0.01, \beta = 0.21$), representing a small effect ($f^2 = 0.07, R^2 = 0.07$). Hours of professional development ($B = -0.001, p < 0.05, \beta = -0.15$) and class type ($B = 0.11, p < 0.05, \beta = 0.22$) were significantly related to *lack of knowledge* response rate, with a small effect ($f^2 = 0.07, R^2 = 0.07$), indicating that teachers with fewer hours of professional development, and taught in special education classrooms, had more reported knowledge gaps related to General Information about ADHD. In addition, professional development ($B = -0.001, p < 0.05, \beta = -0.12$) and education level ($B = -0.07, p = 0.01, \beta = 0.17$) were significantly related to inaccurate response rate on the General Information subscale, with a small to moderate effect ($f^2 = 0.12, R^2 = 0.11$), such that teachers with more hours of professional development and higher levels of education had fewer *misperceptions* regarding general information about ADHD. In comparing regression results and initial correlational analyses, only level of education was significant in both cases. That is, inclusion of the covariates may be responsible for regression effects.

Teacher Characteristics and Treatment of ADHD

Hours of professional development were also significantly related to accuracy on the Treatment subscale ($B = -0.002, p < 0.001, \beta = -0.36$), when investigated via regression analyses, indicating a small to moderate effect ($f^2 = 0.14, R^2 = 0.12$), yet, less professional development was related to greater accuracy on the Treatment subscale. This finding is consistent with initial investigation via correlations.

Table 3 Correlations

Variable	1	2	3	4	5	6	7	8	9	10	11
1. KOAD-C	–										
2. KOAD-I	– .02	–									
3. KOAD-DK	– .40***	– .35***	–								
4. GI-C	.71***	– .09	– .44***	–							
5. GI-I	– .09	.63***	– .27	– .37***	–						
6. GI-DK	– .39***	– .25***	.95***	– .48***	– .27	–					
7. T-C	.55***	.10	.01	– .06	.16*	.06	–				
8. T-I	.09	.64***	– .31***	.20*	.01	– .17	– .11	–			
9. T-DK	– .37***	– .35***	.87***	– .32***	– .21	.73***	– .10	– .48***	–		
10. S-C	.59***	– .01	– .27*	.15	.20**	– .22*	.20*	.02	– .26*	–	
11. S-I	.00	.57***	– .04	.10	– .04	.02	.10	.24**	.07	– .31***	–
12. S-DK	– .27***	– .41***	.82***	– .32***	– .24	.73***	.09	– .22***	.57***	– .25*	– .29*
13. Education	.15	– .24	.01	.13	– .26*	.02	– .03	– .02	.01	.15	– .01
14. PD	– .01	– .11	– .17	.20	– .06	– .16	– .31*	.04	– .13	.05	– .18
15. Class Type	.08	– .11	.16	.10	– .21	.23	.01	– .06	.12	.02	.13
16. Experience	.09	.03	– .05	.07	.12	– .09	.03	– .12	.02	.05	.01
17. Peer	– .09	– .13	.20	– .02	– .06	.21	– .17	– .03	.09	.03	– .18
18. Teacher	– .06	– .10	.21	– .00	– .10	.19	– .09	.07	.18	– .03	.06
19. Academics	– .04	– .10	.22*	.03	– .26**	.25**	– .05	.15	.13	– .10	.01
20. Class	– .08	– .03	.09	.07	– .08	.09	– .15	.02	.09	– .12	.03
21. SE	– .03	– .29**	.04	.15	– .31*	.04	– .28**	– .01	.03	.05	– .15
22. Overall	– .05	– .18	.19	.14	– .20	.20	– .20*	– .02	.13	– .09	– .07
Variable	12	13	14	15	16	17	18	19	20	21	22
1. KOAD-C											
2. KOAD-I											
3. KOAD-DK											
4. GI-C											
5. GI-I											
6. GI-DK											
7. T-C											
8. T-I											
9. T-DK											
10. S-C											
11. S-I											
12. S-DK	–										
13. Education	– .02	–									
14. PD	– .15	– .16	–								
15. Class Type	– .00	.33*	.03	–							
16. Experience	– .04	.17	.17	.07	–						
17. Peer	.20	.13	– .10	.13	.09	–					
18. Teacher	.17	– .06	– .09	– .03	.08	.56***	–				
19. Academics	.13	.04	– .15	.13	.03	.46***	.54***	–			
20. Class	.03	– .07	– .09	– .01	.08	.58***	.47***	.54***	–		
21. SE	.02	– .09	.09	.03	– .01	.42***	.38***	.42***	.40***	–	
22. Overall	.11	.04	– .14	.14	.09	.70***	.59***	.62***	.70***	.50***	–

KOAD-C, Percent answered correctly on KOAD; KOAD-I, Percent answered incorrectly on KOAD; KOAD-DK, Percent answered “Don’t Know” on KOAD; GI, General Information Subscale; T, Treatment Subscale; S, Symptoms Subscale; PD, Professional Development; Peer, teacher-rated impairment with peers; Teacher, teacher-rated impairment with teacher relationship; Academics, teacher-rated impairment in academics; Class, teacher-rated impairment in class in general; SE, teacher-rated impairment in child’s self-esteem; Overall, teacher-rated overall impairment and need for treatment

Table 3 (continued)* $p < .05$; ** $p < .01$; *** $p < .001$

Teacher Characteristics and Symptoms of ADHD

Investigation of teacher characteristics related to preschool teacher knowledge of symptoms of ADHD via regression analyses also reveal that hours of professional development were significantly related to teachers rate of *misperceptions* ($B = -0.002$, $p = 0.01$, $\beta = -0.19$) with a small effect size ($f^2 = 0.05$, $R^2 = 0.05$), and *lack of knowledge* ($B = -0.001$, $p < 0.05$, $\beta = -0.15$) representing a small effect ($f^2 = 0.03$, $R^2 = 0.03$). That is, teachers with more professional development had lower rates of incorrect responses and “don’t know” responses related to ADHD symptoms. Neither of these effects were significant in initial correlation analyses, so may be due to the inclusion of the other demographic and response category covariates.

Knowledge of ADHD and Ratings of Child Impairment

To investigate the final study aim and understand how teacher knowledge of ADHD is related to ratings of child impairment, a series of multiple regression analyses were conducted. All regression analyses were conducted in Mplus with MLR estimation, and full information maximum likelihood was used to account for missing data. All regression analyses controlled for teacher education, professional development, years of experience, and class type. First, overall response rates on the KOAD were examined. Regression analyses revealed that higher rates of *lack of knowledge* regarding ADHD were related to higher ratings of impairment related to the child’s relationship with the teacher ($B = 2.27$, $p < 0.05$, $\beta = 0.11$), representing a small effect ($f^2 = 0.07$, $R^2 = 0.07$). *Misperceptions* regarding ADHD were related to lower ratings of impairment related to children’s self-esteem ($B = -5.68$, $p < 0.01$, $\beta = -0.34$), with a small to moderate effect ($f^2 = 0.14$, $R^2 = 0.12$). That is, teachers with higher rates of inaccuracy rated impairment in children’s self-esteem lower. *Accurate* knowledge of ADHD did not predict ratings of impairment on any of the domains. Similar to previous results, there are some discrepancies between the results from the correlation analyses and the regression analyses. That is, correlation analyses indicated a significant positive relationship between teacher ratings of academic impairment and teacher *lack of knowledge*, though this relationship was no longer significant when including covariates. Additionally, there was not a significant correlational relationship between *lack of knowledge* rates and impairment ratings on

the child–teacher relationship, though this was significant when investigated using covariates in regression analyses.

Misperceptions of ADHD and Ratings of Impairment

In subsequent investigation within the KOAD subscales, several significant relationships were identified. *Misperception* (i.e., incorrect response), rates on the Treatment subscale ($B = 2.88$, $p < 0.05$, $\beta = 0.24$) was related to teacher ratings of children’s academic impairment with a small effect ($f^2 = 0.09$, $R^2 = 0.08$), such that, greater *misperceptions* regarding Treatment were related to higher ratings of academic impairment. This relationship was not significant in correlation analyses, though was significant when covariates were included, indicating potential cooperative suppression. *Misperceptions* on the General Information subscale were also related to teachers’ ratings of children’s self-esteem, $B = -3.90$ $p = 0.001$, $\beta = -0.06$, with a moderate effect size ($f^2 = 0.20$, $R^2 = 0.17$), such that greater rates of *misperceptions* of general information about ADHD were related to lower impairment ratings of children’s self-esteem, which was also significant in initial correlation analyses.

Lack of Knowledge of ADHD and Ratings of Impairment

Next, teachers’ *lack of knowledge* (i.e., don’t know responses) of ADHD across subscales was examined in relation to their ratings of child impairment. *Lack of knowledge* rates across the General Information subscale was significantly related to ratings of impairment with peers ($B = 1.70$ $p < 0.05$, $\beta = -0.06$) and overall child impairment ($B = 1.74$, $p < 0.05$, $\beta = -0.06$), with small ($f^2 = 0.09$, $R^2 = 0.08$) and moderate effects ($f^2 = 0.17$, $R^2 = 0.14$), respectively, such that greater rates of *lack of knowledge* on all subscales were related to higher ratings child impairment with peers and overall. Neither of these relationships were significant in initial investigation via correlation but became significant with the addition of covariates. Additionally, *lack of knowledge* rates on the Treatment ($B = 2.58$ $p = 0.01$, $\beta = 0.23$) and Symptoms ($B = 1.97$ $p < 0.05$, $\beta = 0.23$) subscales were related to ratings of impairment in the child–teacher relationship, with small effect sizes for both Treatment ($f^2 = 0.09$, $R^2 = 0.08$), and Symptoms ($f^2 = 0.06$, $R^2 = 0.07$), such that greater rates of *lack of knowledge* on both subscales were related to higher ratings of impairment. *Lack of knowledge* did not predict any other impairment ratings.

Accurate Knowledge of ADHD and Ratings of Impairment

Finally, *accurate knowledge* (i.e., correct responses) was examined in relation to ratings of child impairment. *Accurate knowledge* rates of ADHD treatment were related to teacher ratings of impairment with peers ($B = -2.28, p < 0.05$) with a small effect ($f^2 = 0.09, R^2 = 0.08$), impairment in child's self-esteem ($B = -3.14, p < 0.05$) representing a small effect ($f^2 = 0.09, R^2 = 0.08$), and overall rating of child impairment ($B = -2.60, p < 0.05$) with a small to moderate effect ($f^2 = 0.12, R^2 = 0.11$). That is, teachers with more *accurate knowledge* of treatments for ADHD rated the child as *less* impaired. Of note, the relationship between treatment accuracy and impairment with peers was not identified via correlations, though the other two relationships remained significant in the same direction.

Discussion

The current findings reveal important information regarding preschool teacher knowledge of ADHD and ratings of child impairment in a sample of culturally diverse preschool teachers of children presenting for treatment. This is particularly important given that inherent cultural biases impact teacher behavior toward minority youth, especially Black/African-American boys (Gilliam et al., 2016), and young children from cultural and ethnic minority backgrounds are at an even higher risk for the negative outcomes associated with ADHD diagnoses (Gutman et al., 2003; Mistry et al., 2008). As hypothesized and found in other literature regarding teacher knowledge of ADHD, there are considerable gaps in teacher knowledge of ADHD (Kos et al., 2004; Poznanski et al., 2018; Stormont & Stebbins, 2005). In particular, preschool teachers in the current sample, on average, had lower rates of accuracy than studies of preservice teachers, elementary teachers, and other preschool teachers (Kos et al., 2004; Poznanski et al., 2018; Stormont & Stebbins, 2005), with accuracy rates under 40%. Additionally, teachers had misperceptions about over a third of ADHD facts. These findings are further elaborated below.

Similar to other work in elementary samples (Poznanski et al., 2018; Scituito et al., 2000), preschool teachers differed greatly in their knowledge rates across the subscales (i.e., General Information, Symptoms, and Treatment) of the ADHD knowledge measure, in that teachers had the lowest rates of knowledge of symptoms of ADHD and treatments for ADHD. That is, teachers were less accurate, had greater misperceptions, and greater lack of knowledge on these domains compared to the General Information subscale. These trends suggest a strong need for more accurate education about ADHD in training and professional development opportunities for preschool teachers, given the

literature that suggests knowledge may be a barrier to intervention implementation and the benefits of targeting knowledge in consultation practices (e.g., Owens et al., 2017). Of note, knowledge regarding the symptoms and treatment of ADHD are, arguably, the most relevant aspects of ADHD knowledge to teachers' work, as teacher input is vital to the referral process, accurate assessment, diagnostic decisions, and treatment of children with ADHD (Pelham et al., 2005). Without an understanding of the symptoms of ADHD and treatment for ADHD, preschool teachers may not be able to recognize ADHD in their classrooms and subsequently may not employ and recommend effective intervention and referrals. This may lead to a missed opportunity for young children with behavioral challenges to receive early intervention services that both prevent longer-term impairment and have a huge societal cost–benefit.

Investigation of the item by item responses on the ADHD knowledge measure reveals misperceptions that may be particularly problematic. Specifically, one of the most common misperceptions regarding ADHD, as identified in previous studies of preservice teachers (Poznanski et al., 2018), is that if parents are not involved in treatment, classroom interventions will not be effective. This has particular implications for preschool children with ADHD who have minimal parental involvement. Arguably, these children may benefit most from consistency and intervention in the classroom, as they may not be receiving this consistency at home. Yet, this misconception may keep teachers from delivering effective interventions for ADHD when they perceive children's parents to be less engaged. Of additional interest, teachers accurately recognize that classroom interventions can change the behavior of children with ADHD, but largely did not recognize that classroom interventions may, in turn, improve the academic functioning for children with ADHD. This misperception may keep teachers from implementing behavioral classroom strategies when children are struggling with early academic concepts. Preschool teachers in this sample also had misperceptions regarding effective treatments for ADHD, and incorrectly indicated that diet change and individual therapy are effective ways of treating ADHD. These types of unhelpful beliefs regarding intervention have also been highlighted as barriers to intervention integrity in elementary samples (Owens et al., 2017), and given the important role that teachers play in early referrals and recommendations, such misinformation may impact suggestions teachers are making to families, and could prevent preschool children with ADHD symptomatology from accessing effective early treatments.

As in the previous literature and hypothesized, in the current study, preschool teacher characteristics impacted teacher knowledge of ADHD. In particular, professional development seemed to relate to knowledge of ADHD across subscales, in that, generally, teachers with more reported

hours of professional development had fewer misperceptions of ADHD and fewer gaps in knowledge (i.e., *lack of knowledge*). Interestingly, teachers who had more professional development actually had lower accuracy on the treatment subscale, which may be more relevant to practice, given the importance and impact of early classroom intervention for students with ADHD (McGoey et al., 2002; Webster-Stratton et al., 2013). Professional development in early childhood education settings may not include accurate information regarding common treatments for the disorder, which has significant professional application. In addition, teachers with higher levels of education had fewer misperceptions regarding general information about the disorder, highlighting how differences in educational attainment and expectations for the preschool workforce may impact their understanding of common mental health concerns. These findings have direct implications for professional development intervention for preschool teachers. That is, professional development should include relevant information about mental health problems such as information about recognition of common early childhood concerns, including ADHD, and provide accurate information regarding evidence-based treatments. Additionally, years of experience teaching was not related to knowledge of ADHD, which is inconsistent from what has been identified in the previous literature (e.g., Anderson et al., 2012).

When comparing type of classroom (i.e., special education versus general education), special education teachers had higher reported lack of knowledge regarding both general information and treatment of ADHD. That is, they answered “don’t know” on more items on these subscales than general education teachers, indicating that special education teachers may be more aware of gaps in their knowledge regarding ADHD than teachers in general education. Therefore, even special education preschool teachers need more ongoing training regarding symptoms of ADHD, in order to increase accuracy in identifying ADHD in their classrooms, which may link more children to needed resources.

In terms of ratings of child impairment, this is the first study in a preschool sample to investigate the impact of teacher knowledge of ADHD on ratings of child impairment in a sample of treatment-seeking children. Given the importance of the student–teacher relationship in outcomes for young children with ADHD (Burchinal et al., 2002; Hamre & Pianta 2001; Rushton et al., 2020), understanding factors that impact child impairment in school is essential, and may be an important first intervention target. Analyses yielded significant findings with small to moderate effect sizes. Teachers’ overall *misperceptions* of ADHD, as hypothesized, were related to lower ratings of impairment in children’s self-esteem. As may have been expected due to patterns of teacher response to ADHD identified in previous

studies (Stormont & Stebbins, 2005), teachers who understood less about ADHD rated children as less impaired in their self-esteem. This may suggest that these teachers do not recognize how symptoms of ADHD may impact children’s mood and functioning which may lead to more internal attributions of child behavior problems. Additionally, teachers’ overall lack of knowledge regarding the disorder was related to higher ratings of impairment in the student–teacher relationship. This may be because teachers who do not have knowledge about how to recognize and treat ADHD may view the child’s behaviors associated with ADHD as more of a hindrance to relationship building. Again, given the importance of early student–teacher relationships (Burchinal et al., 2002; Hamre & Pianta 2001; Rushton et al., 2020), this is especially concerning, and should be a target of intervention. In an investigation of these relationships related to the ADHD subscales (i.e., general information, symptoms, treatment), some similar patterns were found related to teacher ratings of impairment. That is, misperceptions of treatments for and general information about ADHD were related to greater ratings of academic impairment and lower ratings of self-esteem, respectively. This provides additional support for the notion that teachers with less understanding of how to effectively treat ADHD perceive that the child’s difficulties significantly impact their academics (Cornett-Ruiz & Hendricks, 1993). This may also be because teachers with greater misperceptions regarding treatment are not utilizing effective strategies in the classroom which could, in turn, actually impact students’ academic functioning. Teachers who had greater knowledge gaps in general information about ADHD also rated children as more impaired in peer relationships and a greater overall need for treatment. Similarly, teachers who had gaps in symptom and treatment knowledge, again, conceptualized as the more vital domains of teacher understanding, rated the student–teacher relationship as more impaired. As described above, this has significant implications for student success. Importantly, too, accurate knowledge of treatment of ADHD was related to lower ratings of child impairment with peers, self-esteem, and overall need for treatment, which is contrary to our initial hypothesis. Though, these teachers may better understand how to address ADHD in the classroom context, and, in turn, perceive children with ADHD to have less impairment across domains. That is, they may be using appropriate strategies to address children with ADHD, as was found in the previous literature (e.g., Ohan et al., 2008), which may ultimately relate to lower impairment. Overall, teachers’ understanding of ADHD has clear impact on teacher ratings of children’s impairment, which may provide insight both into teacher perceptions of ADHD, and their use of effective strategies to lower school impairment for preschoolers with ADHD.

Despite the important implications of this study, there are some limitations that can be addressed with future scholarship. Though this is a diverse sample, it is only representative of a single school district, which may limit generalizability to other preschool teaching samples who may have different demographics or requirements regarding education level and professional development opportunities. Still, this study was conducted in one of the largest and most diverse school districts in the USA. Additionally, there may be cultural differences in the understanding of mental health problems, that may or may not have been captured by this sample. Future studies would do well to include teachers from more regions in the USA and may statistically examine cultural differences in knowledge and ratings of child impairment. Teachers also completed both the knowledge scales and impairment ratings. This allowed for a connection between knowledge and impairment ratings, though the impairment is limited to a conceptualization of perceived impairment rather than actual impairment across domains, as the study relied on teacher report rather than objective measures.

Future studies should also include assessment of strategies related to practices for children with ADHD. Specifically related to teachers' management of classroom behaviors for children with ADHD, any classroom interventions utilized for children with ADHD, their actual recognition of symptoms of ADHD, and referrals for children with ADHD symptomatology. Though the findings of the present study identify significant gaps in teacher knowledge, the extent to which teachers need knowledge of ADHD, the connection of knowledge to practice, and the types of ADHD knowledge that may be important to practice still need future empirical work. Though knowledge has been understood as a key component to behavior change and is related to intervention integrity (Borko & Putnam, 1995; Domitrovich et al., 2008; Han & Weiss, 2005; Noell et al., 1997; Owens et al., 2017), the literature is not clear on the direct link between knowledge and application. Though, both theoretically and as evidenced by the findings, it appears teacher knowledge of symptoms and treatment may be more important to their work than understanding of general information about the disorder, connecting knowledge to observed practices, and manipulating the acquisition of knowledge, can help to better elucidate these connections to inform intervention.

Overall, the present study is an initial step toward better understanding the knowledge of common mental health concerns among the preschool workforce. More work, indeed, should be conducted to better understand the relationship between teacher knowledge, opinions, perceptions, and practice. It is clear, though, that teacher knowledge is related to perceptions of child impairment, and this provides some information about the importance of addressing teacher knowledge of ADHD, in particular their knowledge

of ADHD symptoms and effective treatments, in intervention and professional development efforts. The findings hold important implications for school mental health professionals, school administrators, and other teachers, as preschool teachers may not have the knowledge of one of the most commonly occurring mental health concern and difficulty in preschool children. Given the importance of early intervention for young children with ADHD, addressing these gaps in the workforce knowledge and skill set is vital.

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Compliance with Ethical Standards

Conflict of interest Bridget Poznanski declares that she has no conflicts of interest. Katie C. Hart declares that she has no conflicts of interest. Paulo A. Graziano declares that he has no conflicts of interest.

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