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Diagnosis and treatment of children and adolescents with autism and ADHD

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Abstract

Attention-deficit/hyperactivity disorder (ADHD) and autism are neurodevelopmental disorders that emerge in childhood. There is increasing recognition that ADHD and autism frequently co-occur. Yet, questions remain among clinicians regarding the best ways to evaluate and treat co-occurring autism and ADHD. This review outlines issues relevant to providing evidence-based practice to individuals and families who may be experiencing difficulties associated with co-occurring autism and ADHD. After describing the complexities of the co-occurrence of autism and ADHD, we present practical considerations for best practice assessment and treatment of co-occurring autism and ADHD. Regarding assessment, this includes considerations for interviewing parents/caregivers and youth, using validated parent and teacher rating scales, conducting cognitive assessments, and conducting behavior observations. Regarding treatment, consideration is given to behavioral management, school-based interventions, social skills development, and the use of medications. Throughout, we note the quality of evidence that supports a particular component of assessment or treatment, highlighting when evidence is most relevant to those with co-occurring autism and ADHD across stages of development. In light of the current evidence for assessment and treatment of

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co-occurring autism and ADHD, we conclude by outlining practical implications for clinical and educational practice.

KEYWORDS
assessment, Autism ADHD Comorbidity, treatment

1 | INTRODUCTION

Autism and attention-deficit/hyperactivity disorder (ADHD) are two prevalent neurodevelopmental disorders, with estimates of 1.5%–2% (Maenner et al., 2020) and 5%–9% (Danielson et al., 2018), respectively. Diagnostically, autism is characterized by pervasive challenges with social communication and the presence of restricted and/or repetitive behaviors and interests, while ADHD is characterized by developmentally inappropriate symptoms of inattention and/or hyperactivity-impulsivity (American Psychiatric Association, 2013). Although symptom profiles are conceptually distinct, consistent empirical evidence demonstrates that co-occurrence is common, something now formally recognized in the *Diagnostic and Statistical Manual-5th Edition* (*DSM-5*) which no longer prohibits a comorbid diagnosis. Critically, for educational and healthcare practitioners, recognition that autism and ADHD co-occur underscores a need to move beyond previously established guidelines developed based on the assumption that autism and ADHD are strictly independent conditions and incorporate practice approaches that do recognize the co-occurrence of autism and ADHD (Young et al., 2020).

Previous recommendations for the assessment and treatment of co-occurring autism and ADHD have been generated through expert consensus, largely based on evidence for assessing and treating each disorder separately (Young et al., 2020). Given the immediate need to provide support for those with co-occurring autism and ADHD,[1] this strategy is reasonable yet poses some complications. For instance, those with co-occurring autism and ADHD exhibit greater impairment on a range of measures than those with either diagnosis alone, including cognitive (Andersen et al., 2013; Rao & Landa, 2014) and psychosocial functioning (Sikora et al., 2012), and additional comorbidities like oppositional defiant disorder (Jang et al., 2013).

The goal of this paper is to describe evidence-based approaches for assessing and treating co-occurring autism and ADHD by highlighting, whenever possible, findings from research that specifically included measures of both autism and ADHD symptoms and/or diagnoses. We first briefly summarize the research on such co-occurrence. Second, we review research on the assessment of autism and ADHD with a focus on practical applications for differential diagnosis (i.e., cases where there's some degree of symptoms of both conditions involved, and the clinical question is whether it's one or the other, or both). Third, we describe research on the treatment of co-occurring autism and ADHD. Unique from previous such reviews, we highlight implications for the educational setting. The hope is that this review provides relevant guidelines for practitioners when faced with students who evidence a combination of both autism and ADHD symptoms, both with respect to diagnostic process and relevant intervention guidance.

2 | CO-OCCURRENCE OF AUTISM AND ADHD

Compared to typically developing peers, children with ADHD are more likely to exhibit autism symptoms or associated characteristics. For instance, Grzadzinski et al. (2016) showed that 21% of an ADHD group scored above the cutoff for ASD on the Autism Diagnostic Observation Schedule (ADOS), and 30% met cut-offs on all domains of

[1]Throughout, we use both person- and identity-first language in light of varying stakeholder preferences (Botha et al., 2021).

the Autism Diagnostic Interview-Revised. Other studies have demonstrated that those with ADHD exhibit higher autism symptom severity than typically developing peers (Kotte et al., 2013; Reiersen et al., 2007) and experience more difficulties with interpersonal social communication as well as restricted, repetitive, and stereotyped behaviors (Hollingdale et al., 2020; Jang et al., 2013). Moreover, like autistic children, children and adolescents with ADHD differ from their typically developing peers across a range of laboratory-based measures of social cognition, including empathy and emotion recognition (Demopoulos et al., 2013; Uekermann et al., 2010), and sensory processing (Little et al., 2018). Children with ADHD who have social communication difficulties are also more likely to exhibit patterns of repetitive behaviors, developmental issues, and speech and language deficits similar to those observed in autism (Santosh & Mijovic, 2004).

While inattention and hyperactivity-impulsivity are defining features of ADHD, autistic children may also exhibit differences in attention and activity level (Lyall et al., 2017; Sinzig et al., 2009). In a study examining ADHD symptoms in children with autism, parents and teachers reported that 49%–50% children exhibited difficulties while concentrating, 42%–44% exhibited elevated activity levels, and 60% were easily distracted (Lecavalier, 2006). These findings have been supported by other studies focusing on the co-occurrence of autism and ADHD (Rowlandson & Smith, 2009; Yoshida & Uchiyama, 2004).

2.1 | Developmental changes

Symptoms of autism and ADHD are known to present differently across development. For example, hyperactive-impulsive symptoms are more frequently reported in young children, while inattentive symptoms are endorsed more frequently in older children (Curchack-Lichtin et al., 2014). Studies of autism symptoms have shown that as individuals age, some symptoms show stability (e.g., rigidity and insistence on sameness) and others show improvements (e.g., social reciprocity) (Bal et al., 2019; Richler et al., 2010; Shattuck et al., 2007; Waizbard-Bartov et al., 2021). The co-occurrence of autism and ADHD also appears to change with age. Converging evidence suggests correlations between autism and ADHD symptoms are strongest during adolescence (see Hartman et al., 2016), although this is predominantly based on cross-sectional studies, it suggests that monitoring for co-occurrence should be a continuous process over time.

2.2 | Co-occurring autism and adhd and functional impairment

The co-occurrence of ADHD and autism may impact other areas of functioning more than autism or ADHD in isolation. For children diagnosed with autism, clinically significant ADHD symptoms are associated with impairments in adaptive functioning and overall poorer quality of life (Sikora et al., 2012), greater cognitive delays (Andersen et al., 2013; Rao & Landa, 2014; Sinzig et al., 2008), and impaired executive functioning (Yerys et al., 2009). Likewise, higher autism symptom severity in children with ADHD is associated with increased emotional and conduct problems and decreased quality of life (Green et al., 2016). Together, these findings emphasize that autism symptoms should be evaluated in individuals with ADHD and vice versa and, if present, should be included in the overall intervention plan.

3 | DIAGNOSTIC ASSESSMENT AND INTERVENTION

3.1 | Collaborative partnerships

Collaborative partnerships, often described as family-professional partnerships when referring to cooperation between schools and families, have long been recognized as integral to successful assessment and treatment of

psychological and behavioral problems in childhood and adolescence (Esler et al., 2002). Collaborative partnerships include using shared decision-making processes, such that assessments and treatments are sensitive to each individual's and family's unique profiles of strengths and challenges, as well as personal preferences (Liverpool et al., 2021). Collaborative partnerships also provide opportunities for psychoeducation, which includes clarifying with families any potential misconceptions about a condition and problem-solving barriers to intervention adherence (Dahl et al., 2020). While all children and families likely benefit from a collaborative approach tailored to each family, it is especially important to engaging older children and adolescents in the assessment and treatment process (Hogue et al., 2020). Evidence demonstrates that collaborative partnerships improve family engagement in assessment and treatment of ADHD (Dahl et al., 2020) and autism (Dawson-Squibb et al., 2020; Levy et al., 2016) separately. Thus, it is also likely to be an important element in the treatment of co-occurring autism and ADHD. Best practice assessment and treatment of co-occurring autism and ADHD should occur within a collaborative partnership framework.

3.2 | Neurodiversity

There is increasing interest in perspectives on autism and ADHD raised by proponents of the neurodiversity movement (Sonuga-Barke & Thapar, 2021). This has raised awareness that research on evidence-based best practices can benefit by adopting collaborative and coproduction practices, such as members of the autistic community informing research priorities (Pellicano & Houting, 2022). Additionally, the neurodiversity movement has highlighted that environmental adjustments may also benefit autistic individuals and others by promoting acceptance and inclusion (Pellicano & Houting, 2022). These perspectives, although not often integrated into the current evidence-base that informs the assessment and interventions for co-occurring autism and ADHD (at least explicitly), may provide useful guidance for future developments, including developments in assessment and interventions in the context of schools. One such example is the proposal of a school-wide approach to supporting autistic students (Roberts & Webster, 2022)

3.3 | Assessment of co-occurring autism and ADHD and differential diagnosis

The value of carefully assessing both autism and ADHD is highlighted by data demonstrating that a diagnosis of ADHD in young children can delay a diagnosis of autism by several years (Miodovnik et al., 2015). Indeed, the overlap of symptoms and impairments in autism and ADHD often complicates the clinical picture and poses challenges for clinicians. For example, autistic children often exhibit elevated parent- and teacher-reported ADHD symptoms (Sinzig et al., 2009; Yoshida & Uchiyama, 2004) but it can be difficult to decipher what this means. Do elevated levels of inattention or hyperactivity-impulsivity in the context of autism represent the same thing as they do outside that context? For instance, high activity levels exemplified by aimless wandering and difficulty sitting in a chair may represent frank motor activity consistent with ADHD, or alternatively, be secondary to social or communication challenges consistent with autism. Similarly, inattention in the context of autism may not index the same *quality* of inattentiveness or distractibility as would be expected in ADHD, instead reflecting alternate interests in sensory stimuli or lack of cooperation with teacher requests more consistent with social inattention. Likewise, the presence of certain ADHD symptoms—such as inattentiveness in social situations—could result in inaccurate endorsement of autism symptoms in the absence of thorough evaluation. These challenges make careful evaluation and conceptualization of symptoms critical.

Rates of co-occurring diagnoses may be lower when reported by clinicians than based on standardized parent interviews alone (Grzadzinski et al., 2016), and may indicate that clinicians view some parent-reported ADHD symptoms as being accounted for by the autism diagnosis. When considering a co-occurring diagnosis of autism and ADHD, it is important to avoid using the same behavior to satisfy both sets of diagnostic criteria. However, it is also important to avoid diagnostic overshadowing by assuming that all symptoms of one condition are attributable to the other. The issue of diagnostic overshadowing is even more challenging when intellectual impairments are part

of the clinical picture. There are, to our knowledge, no adequate best practice recommendations for this clinical scenario. However, in general, the child's developmental level should be taken into account when considering a dual diagnosis of ADHD and autism. This is because ADHD symptoms must be *developmentally inappropriate* based on the individual's developmental level, not just their chronological age.

Ultimately, the literature indicates that clinical judgment and good clinician training in differential diagnosis is critical, but also reveals the challenges inherent to assessment and diagnosis of co-occurring autism and ADHD. Below, we highlight key 'best practice' considerations when assessing for autism, ADHD, or both. Assessment tools are provided as examples but should not be considered an exhaustive list.

3.3.1 | Developmental history and symptom interview

A thorough developmental history with the youth's caregiver(s) is critical to understanding the developmental context of any apparent autism or ADHD symptoms, as well as for establishing any potential medical issues that may account for or contribute to symptom development. Consistent with general best practice guidelines, clinicians should obtain information about key developmental milestones (e.g., pregnancy and delivery history, age of first single words, phrase speech, crawling, walking), ask about age and type of first concerns, inquire about any regression history, query about prior diagnoses, obtain information about current services, and review medical history (e.g., physical or medical problems, hearing or vision concerns, sleep, appetite, weight change/loss, allergies, medications, major surgeries, history of hospitalizations). Clinical risks should also be evaluated including self-injury or aggression risk, elopement risk, other safety concerns, as well as family stressors/trauma and quality of the parent-child relationship. Clinicians should also inquire about current supports and strengths of the child as well as about the family's key concerns and desired services and goals.

In addition, a structured or semi-structured clinical symptom interview with the caregiver(s) should be conducted and, when appropriate based on developmental stage (i.e., middle childhood, adolescence), with the child themselves. Examples include the Kiddie-Schedule for Affective Disorders & Schizophrenia (Kaufman et al., 1997) and the Diagnostic Interview Schedule for Children (Shaffer et al., 2000), among others. The goal is to better understand the diagnostic landscape, to rule in or out any other potential contributing diagnoses, and to gain more in-depth information than can be gleaned from paper-and-pencil rating scales (see below). Such interviews are also key to evaluating symptom chronicity (especially when making first-time diagnoses of ADHD) and cross-situational impairment.

3.3.2 | Multi-informant ratings representing behavior across settings

Validated broadband questionnaires should be completed by both the caregiver(s) and teacher(s) and may include measures like the Behavior Assessment System for Children (Reynolds & Kamphaus, 2015) or Child Behavior Checklist (Achenbach & Rescorla, 2001). Narrowband parent ratings of both ASD and ADHD symptoms should also be completed by caregiver(s) and teacher(s) to aid in differential diagnosis and/or the determination of co-occurring conditions. These may include the Social Communication Questionnaire (Rutter et al., 2003) and/or Social Responsiveness Scale (Constantino & Gruber, 2012) for autism, and the ADHD Rating Scale (DuPaul et al., 1998) and/or Conners for ADHD (Conners, 2008). It is crucial to obtain ADHD symptom ratings from multiple reporters to determine evidence of cross-situational presence of symptoms as well as presence of impairment in various settings. If symptoms are apparent in only one context, this may be suggestive of alternative diagnoses. Discrepancies between reporters are not uncommon for ADHD symptoms in particular, potentially reflecting differences in context/setting, and in general can be viewed as providing unique clinical information (Narad et al., 2015). In addition, a report of the child's adaptive skills is critical to understanding impairment; validated adaptive behavior ratings should be completed by the caregiver(s) and, if possible, the teacher. Examples include the

Vineland Adaptive Behavior Scales (Sparrow et al., 2012) and the Adaptive Behavior Assessment System (Harrison & Oakland, 2000). When appropriate based on developmental stage and level, self-report ratings may also be obtained from youth. Incorporating self-report measures may provide unique insights that are not ascertainable by informant reports or direct observation, such as experiences of internalizing symptoms (Bakhtiari et al., 2021; Makol et al., 2020; Skarphedinsson et al., 2021).

3.3.3 | Cognitive assessment

Cognitive assessments may not be necessary in all cases (e.g., in cases of straightforward ADHD without concerns of co-occurring autism) but should always be considered, particularly when intellectual functioning is of concern. Moreover, direct assessment of the child's cognitive abilities provides important contextual information and may indicate additional diagnostic considerations (e.g., global developmental delay or intellectual disability). For young children, cognitive testing comes in the form of developmental assessments such as the Mullen Scales of Early Learning (Mullen, 1995) (0–68 months) or the Bayley Scales of Infant Development (Bayley, 2006) (1–42 months). For older children and adolescents, a validated, reliable cognitive/IQ test should be employed (e.g., Stanford-Binet [Roid, 2003], Wechsler Scales [Wechsler, 2003], Differential Abilities Scale [Elliott, 2007]); abbreviated IQ tests may also suffice in situations where time and/or resources are limited, as is common in school settings (e.g., Wechsler Abbreviated Scales of Intelligence [Wechsler, 2011]).

3.3.4 | Behavioral observation and direct assessment of symptoms

Throughout the assessment process, the psychologist should note any behaviors indicative of autism and/or ADHD, and the contexts in which such behaviors arise. Direct assessment of autism symptoms should be utilized whenever possible, not because the scores are necessarily determinative, but because the tools designed for such evaluations provide an opportunity to directly probe for relevant behaviors. The gold-standard tool for this purpose is the Autism Diagnostic Observation Schedule, 2nd Edition (ADOS-2; Lord et al., 2012). There are no equivalent gold-standard, clinically-validated tools available for direct assessment of ADHD. In fact, direct observation during clinical assessment may not always reveal ADHD symptoms since children with ADHD can often regulate their attention and behavior adequately for brief periods of time, especially in structured settings and/or novel environments with unfamiliar adults. However, school (playground and/or classroom-based) observations may provide an opportunity to observe the degree to which symptoms are impairing in social and academic settings, particularly for elementary-aged children.

3.3.5 | Other considerations for assessment

Other domains that may be relevant include academic achievement testing, speech and language testing (often a core component of autism assessments), motor and perceptual skills assessment, and curriculum-based assessments. Assessing for the co-occurrence of learning disabilities via validated academic achievement tests may be warranted given frequent co-occurrence with both ADHD (DuPaul et al., 2013) and autism (Boucher, 2012; Keen et al., 2016). Assessment of co-occurring symptoms may also benefit from a dimensional approach, since these measures are better suited to providing a more nuanced profile of relative strengths and challenges for a given individual (Hartman et al., 2016; Mikami et al., 2019).

Different approaches to assessment are required depending on developmental level and age since symptom presentations change over the course of development. Indeed, the extent to which a particular symptom description is useful to understanding the presentation of ASD or ADHD depends upon age/developmental level

(DuPaul et al., 2020). This is also important because of concomitant changes in the environment; for example, while high school students cycle through multiple teachers over the course of a day, elementary students are generally assigned to a single teacher (Sibley et al., 2012). Careful consideration of which informants are most familiar with the child is required (Jepsen et al., 2012; Sibley et al., 2012). Likewise, careful consideration of appropriate measures is imperative, prioritizing measures that have norms for autism and ADHD and include individuals with both conditions in the normative samples.

3.3.6 | Integration of assessment information

Integrating assessment information across sources is always an important aspect to the diagnostic process, however this can be particularly difficult when questions of both autism and ADHD are involved. In general, when multiple co-occurring diagnoses are being considered, it is important to ask how many diagnoses are needed to describe the child's set of difficulties. Ocam's razor (also often referred to as the "principle of parsimony") states that one should not make more assumptions than the minimum needed. When making these decisions, it can be helpful to consider whether the symptoms in question are beyond the scope of autism or ADHD in isolation, whether there has been a change from previous functioning such as new symptoms or the worsening of certain behaviors, and, if interventions have been implemented, whether they have been effective. On the other hand, as noted previously, it's important to be aware of issues of diagnostic overshadowing. Clinicians should ensure that, when integrating information to arrive at a clinical best estimate diagnosis, they avoid "double counting" of symptoms to meet criteria for both conditions, and they are consider any potential symptoms within the context of an individual's developmental level.

3.4 | Treatment/intervention for co-occurring autism and ADHD

A key goal of assessment is to inform the provision of treatment/intervention. In general, the primary goal of treatment should be to reduce impairment and/or disability, in accordance with each individual child's/family's goals. As previously noted, interventions should be sensitive to each individual's and family's unique profiles of strengths and challenges, as well as personal goals. This point is emphasized by research on lived-experiences perspectives highlighting that treatment goals of autistic individuals can often be overlooked (Hodges et al., 2020; Leaf et al., 2022). In addition to focusing individual needs, interventions and supports should also be evidence-based; however, unlike the body of research for treating autism and ADHD separately, research for treating their co-occurrence is less substantial. Thus, in outlining the treatment options below, we indicate the quality of supporting evidence and highlight research conducted with preschool- to high school-aged children presenting with co-occurring autism and ADHD.

3.4.1 | Home-based behavioral management

Behaviorally-based strategies are a recommended first-line intervention for autism (Dawson & Burner, 2011), and are commonly recommended for ADHD (Daley et al., 2018; Halperin & Marks, 2019) especially in combination with medication. These strategies are founded on established principles of learning and behavioral conditioning, with an emphasis on implementing reinforcements for desired target behaviors and ignoring unwanted or off-task behaviors (Hinshaw, 2018). Evidence-based strategies for young children diagnosed with autism typically involve one-on-one sessions with a trained behavioral specialist. In addition, practitioners may also work one-on-one with the parents/family members to implement reinforcing consequences for developmentally appropriate social and

communication behaviors. Improvements in social communication, language, and play skills have been documented, particularly when implemented in a naturalistic setting (e.g., at home or within the classroom) with natural rewards such as praise (Sandbank et al., 2020; Schreibman et al., 2015). Although much of this evidence is from studies of toddlers, there is also evidence supporting similar results for older autistic children and adolescents (Dawson & Burner, 2011; Ratliff-Black & Therrien, 2021).

Behavioral interventions for ADHD typically comes in the form of time-limited parent training sessions (individual or group-based) focused on building the parent's ability to provide reinforcement of appropriate behaviors (e.g., waiting one's turn) and ignoring disruptive behaviors (e.g., temper-tantrums). Often these strategies are combined with medication (discussed further below). Although behavioral interventions are not as effective at improving core ADHD symptoms as medication, randomized controlled trials (RCTs) suggest that behavioral interventions for ADHD that are based on these strategies have an overall positive effect across a range of outcome measures, including core ADHD symptoms, parent-child interactions, internalizing symptoms, conduct problems, and disruptive classroom behavior (reviewed in Daley et al., 2018; Hinshaw, 2007). Much of this evidence is for elementary or middle-school-age children (i.e., 5–10 years) (Jensen et al., 2001; Van der Oord et al., 2008) and preschool age children (Abikoff et al., 2015; Franke et al., 2020; Mulqueen et al., 2015; Rimestad et al., 2019), with fewer studies on the efficacy of parent-based behavioral management strategies for adolescents (reviewed in Chan et al., 2016).

Given that behavioral management strategies for autism or ADHD alone differ in behavioral targets and method of delivery, it is unclear how to best integrate these approaches for children with co-occurring autism and ADHD (Brookman-Frazee et al., 2006). Several studies have examined whether parent training programs similar to those shown to be effective for reducing disruptive behaviors of children with ADHD can be adapted for children with autism (Tarver et al., 2019), demonstrating that behavioral parent training can reduce disruptive or noncompliant behavior and hyperactivity/impulsivity in children ages 3–15 years (Bearss et al., 2015; Handen et al., 2015; Tarver et al., 2019). These findings are promising, but several issues must be addressed. First, whether these effects will hold when outcome measures are obtained from those unaware of the treatment, such as teachers, is unclear. Second, further work is required to clarify what elements of training are most beneficial for treating co-occurring autism and ADHD, particularly since some elements (e.g., time-out) may reduce disruptive behavior for those with ADHD but reinforce disruptive behavior for those with autism (Tarver et al., 2019).

3.4.2 | School-based behavioral interventions

As noted previously, autism and ADHD are associated with disruptions in functioning across multiple settings, including social and academic difficulties at school; effective interventions for co-occurring autism and ADHD must therefore also target functioning at school. To our knowledge, no study has specifically evaluated the effectiveness of behavioral interventions on school functioning for children with co-occurring ADHD and ASD. As such, we must rely on extrapolating from evidence for children with each individual diagnosis.

Most research on school-based behavioral interventions for ADHD has concerned classroom contingency management for elementary students (DuPaul et al., 2012). This includes the use of daily report cards by which parents provide home-based rewards contingent on target behaviors at school (Merrill et al., 2017), token economies (Trout et al., 2007), and time out from positive reinforcement (Fabiano et al., 2004). There has been consistent evidence of positive effects on both behavior and academic functioning for elementary- and middle school-age children (DuPaul et al., 2012). Currently, we know of no published trials examining the effectiveness of classroom contingency management for high school children with ADHD.

Research on school-based interventions for autism has had a focus on improving social behaviors and skills in preschool and elementary school-age children (Whalon et al., 2015). The need for these interventions is clear, given that social skills interventions delivered outside of school may not generalize across to school settings (Gates

et al., 2017). However, although interventions involving training school staff or peers to support social communication behaviors have some positive effects on social skills for preschool and elementary students with autism, further research involving RCT designs is required (Whalon et al., 2015).

3.4.3 | Academic interventions

Co-occurring autism and ADHD is often linked to academic difficulties (Chiang & Gau, 2016), which are typically addressed by a combination of accommodations and/or modifications. Often delivered through what are referred to as Individualized Education Plans (IEP) or Section 504 plans in the United States, these adjustments to educational practices include allowing extended time to complete tests and assignments, providing teacher or peer prepared notes from class, and reducing lengths of assignments (Harrison et al., 2013), as well as other supports targeting specific goals identified through the IEP process (e.g., speech-language therapy, occupational therapy, social skills groups, other school-based behavioral supports).

There is evidence that organizational skills training (e.g., time management, planning, and study skills), provided via individual clinic sessions, specialist after-school programs, or school psychologists or counselors during the school day, can have positive effects on academic skills and grades for elementary-, middle-, and early high school-age children diagnosed with ADHD (Abikoff et al., 2013; Evans et al., 2014, 2018; Langberg et al., 2011, 2012). Moreover, some recent research also supports the feasibility of providing organizational skills training customized to autistic adolescents (e.g., greater use of visual supports, interactive activities, and directive teaching) (Kenworthy et al., 2014; Tamm et al., 2021). Taken together, this suggests that organizational skills training may also be beneficial for co-occurring autism and ADHD.

It is important to acknowledge that practitioners working in school settings, including mental health professionals, may often operate within implementation frameworks, including the response to intervention (RTI) framework. Briefly the RTI framework provides a set of problem-solving oriented processes for assessing and treating children within the school setting (Berkeley et al., 2009; Hughes & Dexter, 2011) without reference to particular diagnosis. RTI stipulates a tiered approach to matching service delivery to academic and behavioral needs, as indicated from universal screening and progress monitoring (Hughes & Dexter, 2011). More research is needed in terms of identifying the ways in which frameworks such as RTI can best accommodate evidence-based practices specific to the assessment and treatment of co-occurring autism and ADHD.

3.4.4 | Social skills training

An important distinction to recognize when considering overlaps in social difficulties between children with autism and ADHD is that ADHD is largely characterized by a problems with *performance* rather than knowledge, whereas autism tends to be characterized more by *knowledge* gaps (reviewed in Mikami et al., 2019). That is, children with ADHD generally know the appropriate behavior and often possess social skills such as perspective taking and emotion recognition but have difficulty implementing it due to impulsive tendencies or attention problems, while children with autism tend to experience more fundamental social knowledge difficulties *as well as* challenges executing social skills. This implies that supporting social skills acquisition in children with co-occurring autism and ADHD might adopt an approach that targets both knowledge and performance difficulties. One such intervention is the Program for the Education and Enrichment of Relational Skills (PEERS) (Frankel et al., 1998; Laugeson et al., 2012, 2014), which consists of both social skills training aimed at improving social knowledge gaps, and training parents to structure environments (e.g., during home play dates) to support children's engagement in social interactions. Although no data exists on the outcome of this intervention for co-occurring autism and ADHD, it does appear to benefit children with autism

(Frankel et al., 2010; Laugeson et al., 2012, 2014). Evidence for the effectiveness of social skills training for children with ADHD has been less clear (Frankel et al., 1998; Morris et al., 2021). Taken together this suggests that social skills training may have some promise for co-occurring autism and ADHD primarily related to social communication challenges associated with autism versus ADHD-specific difficulties, but there is a need for further empirical evidence.

3.4.5 | Medication management

For ADHD, there is consistent evidence that stimulant and non-stimulant medications can result in clinically significant reductions in core symptoms for those of elementary school age and older (Catalá-López et al., 2017). Notably, there is also evidence that stimulant and non-stimulant medications can have clinically meaningful effects in reducing symptoms of inattention and hyperactivity-impulsivity in children and adolescents with co-occurring autism and ADHD (Patra et al., 2019; Rodrigues et al., 2020; Sturman et al., 2017). While the evidence for the use of stimulant and non-stimulant medications to treat ADHD symptoms in those with autism is promising, several caveats are notable. For stimulant medications, response rates (defined as ADHD symptom reduction of at least 25% and an improved clinical impression) are much lower in children with co-occurring autism (~50%) compared to children with ADHD alone (~70–90%) (Handen et al., 2000). Moreover, stimulant and non-stimulant medications appear to be more likely to have intolerable side effects (e.g., irritability, social withdrawal) for individuals with autism compared to those with ADHD alone (Handen et al.,, 2015; Patra et al., 2019). Evidence on the effectiveness of medications for preschoolers with elevated ADHD symptoms is limited; while there is some indication of positive effect on symptom remission, it is somewhat smaller than that observed in older children (Greenhill et al., 2006; Riddle et al., 2013).

Based on the current body of evidence, it has been recommended that stimulant-based medications be considered for individuals with autism who continue to present with clinically elevated ADHD symptoms after consistent implementation of evidence-based behavioral strategies for ADHD (Rodrigues et al., 2020; Young et al., 2020). The American Academy of Pediatrics recommends behavioral interventions, rather than medication, as the first-line approach for children with ADHD under the age of 6 (Wolraich et al., 2019), consistent with the UK National Institute for Health and Care Excellence guidelines (National Institute for Health and Care Excellence., 2018). There is currently no evidence supporting the use of medication to directly treat core autism symptoms.

In the context of treating ADHD alone, medication is often combined with other strategies. Research has demonstrated that high quality medication management is particularly helpful for treating the core ADHD symptoms while, as noted previously, behavioral strategies can be effective for improving academic functioning and reducing oppositional behavior and anxiety/depression (Jensen et al., 2001). Likewise, in an RCT comparing the effectiveness of atomoxetine and behavioral parent training in children with co-occurring autism and ADHD, both were found to reduce ADHD symptoms, but atomoxetine was slightly more effective than behavioral parent training. However, behavioral parent training resulted in reductions in irritability and noncompliant behavior (Handen et al., 2015). Additional research in this area is needed given the direct clinical implications of these findings.

3.5 | Implications for clinical and educational practice

Given the current state of knowledge covered herein, several implications for school psychologists and other clinicians are raised for assessing and treating co-occurring autism and ADHD. First, assessment and treatment should consider a child's functioning across multiple domains and settings, which requires collaborative

partnerships. Given students experience a variety of different settings at school (e.g., social and nonsocial, structured and unstructured), school professionals are uniquely positioned to inform both the assessment and treatment of co-occurring autism and ADHD. Thus, in addition to the important contributions of parents and youth, professional personnel involved in this effort may include school mental health staff such as psychologists or school counselors, as well as clinical psychologists, and psychiatrists, among others. Although the specific roles may vary depending upon available resources, time constraints, and local laws and regulations, some should have specialized training in the assessment and treatment of autism and ADHD.

Beyond addressing questions of differential diagnosis (i.e., autism only, ADHD only, co-occurring autism and ADHD), assessments should also provide information on a particular child's/family's profile of strengths, weaknesses, and goals. Interviews with parent(s)/caregiver(s) should be conducted to obtain a developmental history of difficulties characteristic of autism and ADHD, and to screen for any medical issues, and structured or semi-structured interviews should be conducted to detail clinical symptoms. To complement information gained by interview, parents and teachers should be asked to complete validated questionnaires specific to autism and ADHD as well as those that cover a broad range of other clinically relevant symptoms. Direct observations of behavior following a validated procedure should also be considered when assessing for autism. Cognitive measures should be used to assess for possible additional considerations (i.e., global developmental delay or intellectual disability) and can provide opportunities to gain additional contextual information. When integrating assessment information, care should be taken to understand an individuals' profile of strengths and weaknesses. These evaluations require specialized training, and depending on local licensing regulations, it may not be possible to make such diagnoses in the school setting, requiring enough knowledge to know when to refer for a specialty evaluation outside of the educational system. However, such evaluations will, at a minimum, permit the identification of areas of strength and weakness which may be informative in terms of identifying relevant goals and selecting school-based services, accommodations, and modifications.

A rigorous assessment of co-occurring autism and ADHD should be informative for guiding treatment/intervention. While specific treatment/intervention components should be based on individual needs, it is likely that interventions for co-occurring autism and ADHD will involve the collaborative coordination of components across multiple settings, notably home and school. Implementation should involve input from youth, parents, teachers, and physicians, and should include a clear process to allow communication between parents and school to enhance coordination across settings. Behavioral parent training and school-based behavioral contingency strategies should be considered across ages, and stimulant or non-stimulant medications should be considered to reduce difficulties with hyperactivity/impulsivity and inattention of children in elementary school or older. To help address academic difficulties, developing skills such as organization and planning should be considered. Finally, combined social skills training and parent training should be considered to address social communication and peer relationship difficulties.

4 | CONCLUSIONS AND FUTURE DIRECTIONS

There is an established empirical basis recognizing that autism and ADHD can co-occur. The developing evidence-base for assessing and treating their co-occurrence is encouraging, yet there are issues that require further clarification. Research aimed at identifying which measures and procedures are most effective for assessing co-occurring autism and ADHD is warranted given most assessment tools were developed for the purpose of assessing one condition in the absence of the other. Second, although there are several intervention approaches that hold promise for addressing co-occurring autism and ADHD, research empirically testing this is lacking. Third, there is the sometimes overlooked but clear need to develop assessment and treatment approaches sensitive to cultural differences and societal or economic disparities. Exemplary evidence indicating the need for this sensitivity includes data demonstrating that perceptions of symptom presentation (Sonuga-Barke et al., 1993) and rates of accessing treatment (Bishop-Fitzpatrick & Kind, 2017) and school services (DuPaul et al., 2019) differ by income, race, and/or ethnicity. Fourth, as emphasized by the neurodiversity movement, there is a historically overlooked need to

conduct research in collaboration with community members who have lived experiences with co-occurring autism and ADHD. Finally, there is a need for research examining how schools might most effectively make environmental adjustments that benefit neurodiverse students by promoting acceptance and inclusivity.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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