Article

Pragmatic Deficits in Attention Deficit/Hyperactivity Disorder: Systematic Review and Meta-Analysis

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Abstract

Introduction: While poorer pragmatic language skills have been found in attention-deficit/hyperactivity disorder (ADHD) populations, there has been no conclusive evidence of this. We aimed to conduct a meta-analysis of pragmatic language abilities in ADHD populations to definitively demonstrate the extent of pragmatic language deficits in these populations as compared to typically developing (TD) populations.

Methods: Studies were identified using the search terms ((attention deficit) OR (adhd)) AND (pragmatics), and those studies were screened and reviewed for inclusion criteria, descriptive information, and outcome variables in order to conduct a meta-analysis.

Results: A total of 14 studies (5,772 participants) met the criteria for quantitative synthesis. Meta-analysis indicated that ADHD populations exhibited significantly poorer pragmatic language skills than TD populations, with a very large overall effect size of −1.55. These results indicate that pragmatic language is significantly impaired in ADHD populations.

Conclusion: It is suggested that pragmatic language skills may deserve greater surveillance considering the importance of pragmatic language in socio-emotional development, daily life, and academic success. *(J. of Att. Dis. XXXX; XX(X) XX-XX)*

Keywords

attention deficit/hyperactivity disorder, ADHD, pragmatics, systematic review, meta-analysis

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a common yet complex neuropsychiatric disorder of development with a prevalence rate of approximately 5% of school-aged children and approximately 8% of preschool children (Froehlich et al., 2007; Polanczyk et al., 2007). ADHD presents early on in development and is characterized by developmentally inappropriate levels of hyperactivity-impulsivity and inattention, causing impairments across a variety of contexts (Diagnostic & Statistical Manual of Mental Disorders; American Psychiatric Association, 2013). Social functioning difficulties in children with ADHD are commonly reported by these children's parents, peers, and teachers as early as the preschool years (DuPaul et al., 2001). Up to 82% of children with ADHD (of any age) are reported as having social issues, which demonstrates a progressively increasing agreement that these issues are a significant aspect of the disorder (Barkley et al., 1990; Landau et al., 1998). Deficits in social interaction may be related to deficits in pragmatic language, often found in ADHD populations even without any diagnosed language disorder (Green et al., 2014; Väisänen et al., 2014). The connections among ADHD, social problems, and pragmatic language deficits have been studied, showing significantly lower pragmatic language abilities in ADHD populations than in typically developing (TD) populations. However, there has not yet been a meta-analysis examining these studies on pragmatic language in ADHD.

Pragmatic Language

Pragmatic language is a broad domain of language that involves social, emotional, and communicative facets of language use (Adams et al., 2005). In general terms, it is the appropriate use of language in a social context (Bryant, 2009; Grzadzinski et al., 2011). Pragmatics, as one of the five domains of language, manages the use of the other four domains within conversation (Russell, 2007). While it manages these other language domains, it is still distinguished from them as they are considered relatively independent of

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context while pragmatics is not (Camarata & Gibson, 1999). The concept of pragmatics incorporates a wide range of abilities both verbal and nonverbal (Hart et al., 2004). Further, it is central to general social skills, which include abilities such as initiating interactions, communicating using speech or gestures, regulating one's emotions and behavior, and maintaining interactions by replying or asking questions (American Occupational Therapy Association, 2014). Other specific skills associated with pragmatic language include maintaining conversation topics, avoiding excessive talking, engaging in turn-taking during conversation, interpreting others' nonverbal cues, not interrupting, controlling intensity (tone and volume) of speech, displaying appropriate facial expressions, and maintaining appropriate eye contact and physical proximity (Bishop, 2000; Bishop & Baird, 2001; Prutting & Kirchner, 1987). Pragmatic language milestones in typically developing (TD) children begin as early as age two, with TD children able to adapt messages to listeners and react to feedback by this age (Furrow, 1984). After this period, they can maintain conversations with adults, and, by age five, they can repair mistakes made in turn-taking (Ervin-Tripp, 1979). Metapragmatic skills, or the ability to reflect on one's own communication, typically emerge by 6 to 7 years, and these, along with countless other pragmatic abilities, develop and mature throughout the upper elementary years and onward (Andersen-Wood & Smith, 1997; McLaughlin, 1998).

Assessment of pragmatic language is challenging because it is such a "complex and multifaceted" concept that includes various verbal and nonverbal skills that cannot be examined using one single measure (Cordier et al., 2014, 2019, p. 2). Observation in a natural social context such as play with peers is the most promising possibility for assessment, as it gives a perspective into the child's communication in everyday life. However, few measures that can assess pragmatic language in play exist (Adams, 2002). For example, standardized tests, a common method of formal language assessment, do not necessarily capture this dependence on context and instead focus on pragmatic knowledge rather than actual pragmatic performance ability. Another common assessment method includes parent or teacher reports, which can help capture pragmatic language within a social context but can often be biased (Cordier et al., 2019). Because of these relative weaknesses of each individual method, it has been suggested that the best way to approach assessment is to use a combination of discourse analysis (from observation), standardized tests, and parent/teacher reports/questionnaires (Cordier et al., 2014).

Influence of Pragmatic Language

Pragmatic language is critical for academic and social outcomes and plays an important role in developing relationships with peers. For instance, pragmatic language skills are essential in both academic situations, especially those involving group cooperation, and social situations (Westby & Cutler, 1994). They encourage participation in such contexts and are central to success in interactions with peers and to socio-emotional development (Hart et al., 2004). Due to this centrality, children who develop these pragmatic language skills are more successful within social interactions, whereas children who lack these skills are at a social disadvantage (Bierman, 2004). Interestingly, pragmatic language deficits can occur even in the absence of structural or semantic language deficits, as seen on traditional language tests (Bishop & Baird, 2001). Children with these impairments may have good expressive language yet have difficulty understanding implied meaning (Ryder et al., 2008). They may also use too much stereotyped language (Bishop & Norbury, 2002). In general, these children may not fully understand contextual norms of peer group-dominated interactional situations, often leading to disrupted development of appropriate social skills and behavior problems (Ketelaars et al., 2010; Leonard et al., 2011). Not surprisingly, pragmatic language problems have been linked to a higher risk of various emotional and social issues throughout life (Jerome et al., 2002). These issues can be both internalizing and externalizing, encompassing problems in academic performance, peer relationships, and overall psychiatric adjustment and are even associated with multiple psychiatric disorders (Ketelaars et al., 2010; Landa, 2005). Considering the importance of pragmatic language in everyday life and development along with the negative consequences of deficits in this area, it is therefore important to understand the extent of deficits in populations that struggle in social contexts, such as children with ADHD.

Pragmatic Language in ADHD

Children with ADHD are consistently shown to have problems with pragmatic language when compared with TD children. Parents and teachers rated children with ADHD as much lower in pragmatic language and social skills than TD children, yet only marginally different than children with Autism Spectrum Disorder (Bishop & Baird, 2001). In another study, children with ADHD had lower scores on various measures of pragmatic language, with moderate to large effect sizes (Parke et al., 2021). A study on Disruptive Behavior Disorders (DBD) that included both ADHD and Oppositional Defiant Disorder (ODD) found that children with ADHD with or without comorbid ODD had significantly worse pragmatic language skills than TD children, and children with both ADHD and ODD had significantly worse pragmatic language than those with ODD only. These results indicate that children with ADHD are at a high risk for pragmatic language problems when compared to TD and even ODD-only children (Gremillion & Martel, 2014).

In everyday life, these known pragmatic deficits are exhibited in various ways. Social skill issues, like poor eye contact and difficulty developing friendships, are common and are likely due to impairments in social cognition, which includes pragmatic language (Martin & McDonald, 2003; Uekermann et al., 2010). Theoretically, children with ADHD struggle with pragmatic language because ADHD involves poor behavioral inhibition and is related to difficulties with attention, hyperactivity, and impulsivity (Barkley, 1997, 1999). It has been suggested that these problems are associated with deficits in executive function common to children with ADHD (Perkins, 2010; Tannock & Schachar, 1996; Westby & Cutler, 1994). The term "executive function" describes a concept that encompasses multiple related neurocognitive processes that work together to help a person to behave in ways that are goal-driven and purposeful (Green et al., 2014). It is argued that executive function contributes to pragmatic language skills by driving people's ability to respond adaptively in dynamic social situations (Martin & McDonald, 2003).When considering ADHD pragmatic language deficits in relation to hallmark ADHD traits, three of these main aspects of the disorder can be said to relate specifically to issues with pragmatic language. First, inattention can interfere with a person's ability to do things like focus on a conversation, maintain attention in conversation, and read others' social cues (Marshall et al., 2014). Additionally, the issue of poor inhibition in ADHD can lead to deficient abilities in having empathy and taking the perspective of others (Barkley, 2014). Finally, impulsivity often involves the traditional ADHD behavior of interrupting conversations or interactions (Abikoff et al., 2002). These difficulties in ADHD are understandable from a neurobiological perspective, as evidence has shown that social cognition (which includes pragmatic language) is mediated by the prefrontal cortex in the brain, an area where dysfunction has regularly been found in people with ADHD (Amodio & Frith, 2006; Friedman & Rapoport, 2015). Regarding specific behaviors of children with ADHD, many have been found that display the deficits in pragmatic language that have just been discussed. For example, these children struggle to play cooperatively, respond to social cues, and self-regulate their emotions and behaviors, and such issues often lead to poor interactions with peers (Wilkes-Gillan et al., 2017). Other problems seen in children with ADHD include excessive talking (particularly at times when listening is required), difficulties producing fluent and organized elicited speech (as opposed to spontaneous speech), problems adhering to speaker versus listener roles, dominating conversations, not responding to verbal cues from others, and struggling with higher level language tasks like understanding implications and complex elements of stories (Rints et al., 2015). Further, they may use mazes (repetitions, fillers, false starts, and revisions) that are longer and more frequent than do TD children, they might not give enough feedback to conversational partners, they may talk too familiarly to strangers, and they often use private speech (speaking out one's actions while doing them, especially as a method of controlling them) for far longer than TD children (Bishop, 2003; Redmond, 2004; Winsler et al., 2003). Because so much research has shown deficits in the pragmatic language of children with ADHD, it is important to consider this broad base of research all together.

Influence of Pragmatic Language Impairment in ADHD

Children with ADHD consistently experience social difficulties including regular conflicts, peer rejection, and they have few, if any, friendships (Nijmeijer et al., 2008). In general, they are less skilled at adapting their social communication behavior to specific contexts. As a result, these children may get bullied and rejected by their peers (Biederman et al., 2004; Landau & Milich, 1988). This kind of peer rejection has been found to occur often for children with ADHD, as they are disliked more strongly early on, are less preferred socially, and have fewer friends (Bickett & Milich, 1990; Erhardt & Hinshaw, 1994; Hoza et al., 2005). Rejection by peers is then associated with higher risks for outcomes like substance abuse, dropout, delinquency, school issues, and psychopathology (Greene et al., 1997; Klein & Mannuzza, 1991). Such exclusion caused by their ADHD traits prevents these children from engaging socially and learning from social environments, which then worsens their pragmatic language and social problems (Parke et al., 2021). The poor relationships that result from this cycle predict many problems later in life, including social anxiety, antisocial conduct, absenteeism, and generally more of a need for mental health help (Parker & Asher, 1987). Related to mental health, children with pragmatic language deficits often experience comorbid disorders (Leonard et al., 2011). In general, it can clearly be said that children with ADHD and pragmatic language deficits are at risk for challenges in social and emotional functioning that negatively affect their participation in regular childhood activities along with their general well-being and health (Brinton & Fujiki, 2006; Hart et al., 2004). Many of these effects are not limited to childhood, with issues extending into adulthood such as higher rates of divorce and more frequent job loss. Therefore, it is important to have a more robust understanding of pragmatic language in ADHD.

Present Study. Despite the seemingly strong base of research demonstrating significant pragmatic language deficits in ADHD populations, to our best knowledge there is no conclusive evidence for the level of impairment of pragmatic language skills of people with ADHD. A more robust understanding of the effects of ADHD on pragmatic language is needed. In this study, we conducted a systematic review and

meta-analysis of pragmatic language abilities in ADHD to examine the effects of pragmatic skills in ADHD populations as compared to their TD counterparts.

Materials and Methods

This systematic review and meta-analysis were performed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (PRISMA) (Moher et al., 2009).

Data Collection and Identification of Studies

Studies were identified through Pubmed and EMBASE. The search terms ((attention deficit) OR (adhd)) AND (pragmatics) were used. We also examined references from studies identified through the online search for any other studies on pragmatic language in ADHD.

Inclusion Criteria

Inclusion criteria for the present study were as follows:

1. Studies had to measure pragmatic language in ADHD populations compared to non-ADHD populations.
2. Studies had to be original studies (not reviews).
3. Studies had to include both an ADHD group and a typically developing (TD) group (>1 participant in each group).
4. If a study was an intervention, it had to report pre-intervention measures.
5. Studies had to be written or available in English.

Screening

Two stages of screening and review were conducted by the two authors to determine inclusion or exclusion of studies. The first stage, in which the titles and abstracts of articles were screened, was conducted after one duplicate was removed. In this stage, 95 of the remaining 141 studies were excluded. All of these 95 articles were excluded because they did not meet our first criterion of measuring pragmatic language in ADHD populations. In the second stage, during which the remaining 46 articles were assessed in full, a total of 32 articles were excluded. The reasons for exclusions in this stage were as follows: 11 were reviews, nine had no TD comparison group, five were unable to be accessed, three did not report straightforward scores, two did not measure pragmatic language within ADHD populations, and one was an intervention that did not report pre-intervention measures.

Included Studies

All identified articles underwent an initial review of their titles and abstracts. Any articles that did not meet the inclusion criteria were excluded from further review. Articles that either seemed to meet the inclusion criteria or had abstracts that did not provide sufficient information for an inclusion/exclusion decision were then read and reviewed in full. Articles that, after further review, no longer met the inclusion criteria were excluded from further analysis. Reasoning for exclusion of any article was noted. For articles that did meet the inclusion criteria after being reviewed in full, ADHD measure, pragmatics measure, participant age information, and pragmatic language scores were all documented.

All studies included in our meta-analysis used a measure or test of pragmatic language that provided numerical results and age information. One study only provided a range of TD participant ages without a mean and standard deviations, so those had to be calculated. Furthermore, a high score meant higher abilities in the results of some studies, while in others, a high score meant lower abilities. Therefore, scores had to be reversed for any study in which a high score meant lower abilities.

Pragmatic Language Variables Included in Data Analysis

For all studies that used more than one measure or test of pragmatic language skills, we have noted in Table 1 which measure was used in the final meta-analysis. In these cases, CCC-2 was chosen when a pragmatic measure for both the ADHD and TD groups was reported. If CCC-2 pragmatics scores were not reported for both groups, other scores, such as Pragmatics Observational Measure (POM), were used.

Meta-Analytic Procedures

A meta-analysis was conducted with the *metafor* R package (Viechtbauer, 2010). Effect sizes for each study were calculated using Hedge's G, which was employed as an indicator of the standardized mean difference. Overall effect size was calculated by employing the random effects model (Borenstein et al., 2009). Three tests were conducted to estimate the potential influences of publication bias. A rank correlation test was performed for the funnel plot asymmetry by examining representation of study distribution. To detect funnel plot asymmetry, Egger's regression test was used (Egger et al., 1997). Unpublished studies were estimated by the trim and fill method (estimation of unpublished studies) (Duval & Tweedie, 2000).

Results

Of the 142 results we obtained from the literature search, 14 studies (5,772 total participants) met the inclusion criteria. The following studies were excluded: 95 studies after a review of abstract and title, 32 after a review of full text (see Figure 1 for PRISMA). One duplicate study was excluded.

Table 1. List of Studies Included in the Meta-Analysis.

Study	ADHD *n*	TD *n*	ADHD age *M* (*SD*)	TD age *M* (*SD*)	PL measure	ADHD PL score *M* (*SD*)	TDPL score *M* (*SD*)
Caillies et al. (2014)	15	15	108 (15)	108 (15)	Ice Cream Story. Birthday Story	4.7967 (3.6683)	9.1133 (4.4410)
Cordier et al. (2017)	9	9	98 (13)	105 (19)	POM	22.42 (43.06)	38.9 (39.81)
Geurts and Embrechts (2008)	29	29	122.24 (18.23)	121.62 (19.16)	CCC-2: sum D, E, F, G, H	−24.6 (14.1)	−13.1 (9.1)
Gremillion and Martel (2014)	18	30	60.36 (11.4)	51.36 (12.84)	CELF-4Preschool second ed. Descriptive Pragmatic Profile	82.78 (6.89)	92.76 (8.33)
Helland et al. (2016)	169	5,050	96 (6)	96 (6)	Bergen Child Study Screening Questionnaire £4	−0.4 (0.68)	−0.03 (0.2)
Kuijper et al. (2017)	34	36	107 (19)	107 (20)	CCC-2: 5umE,F,G;H	−26.62 (13.23)	−6.37 (5.19)
Lee et al. (2015)	16	10	96 (19.08)	111.6 (21.12)	KASLAT	29.44 (4.1)	40.5 (3.68)
Ludlow et al. (2017)	22	22	155.73 (17.74)	154.36 (12.92)	TASITpt. 2: Social Inference Minimal Test	2.645 (0.8674)	3.27 (0.391)
Nilsen et al. (2013)	27	27	96.12 (12.95)	99.05 (11.09)	CCC-2: sum D, E, F, G, H	−42.35 (15.36)	−10.81 (7.26)
Parke et al. (2021)	25	25	120.84 (22.8)	126.84 (25.08)	CCC-2: sum **E**, G, H, L, J	−29.6 (9.6)	−9.8 (6.7)
Staikova et al. (2013)	28	35	103.44 (22.32)	108.96 (12.96)	CCC-2: sum D, E, F, G	32 (6)	45.67 (6.07)
Timler (2014)	32	12	80.88 (7.89)	80 (13.56)	CCC-2: mean E, F, G, H, L, J	51.27 (11.6)	60.83 (9.91)
Väisänen et al. (2014)	19	19	115 (25.68)	97 (10 32)	CCC-2: mean E, F, G, H	−7.6925 (4.8339)	−12325 (2.0188)
Wilkes-Gillan et al. (2017)	5	5	105 (18)	103 (19)	CCC-2: mean D, E, F, G, H, L, J	14.4286 (19.5763)	52 (35.0897)

Note. CCC-2 subtests are (A) Speech, (B) Syntax, (C) Semantics, (D) Coherence, (E), Inappropriate Initiation, (F), Stereotyped Language, (G), Use of Context, (H), Nonverbal Communication, (I) Social Relations, (J) Interests. POM = Pragmatics Observational Measure; CELF-4 = Clinical Evaluation of Language Fundamentals - fourth ed; KASLAT = Korean Autism Social Language Test; TASIT = The Awareness of Social Inference Test.

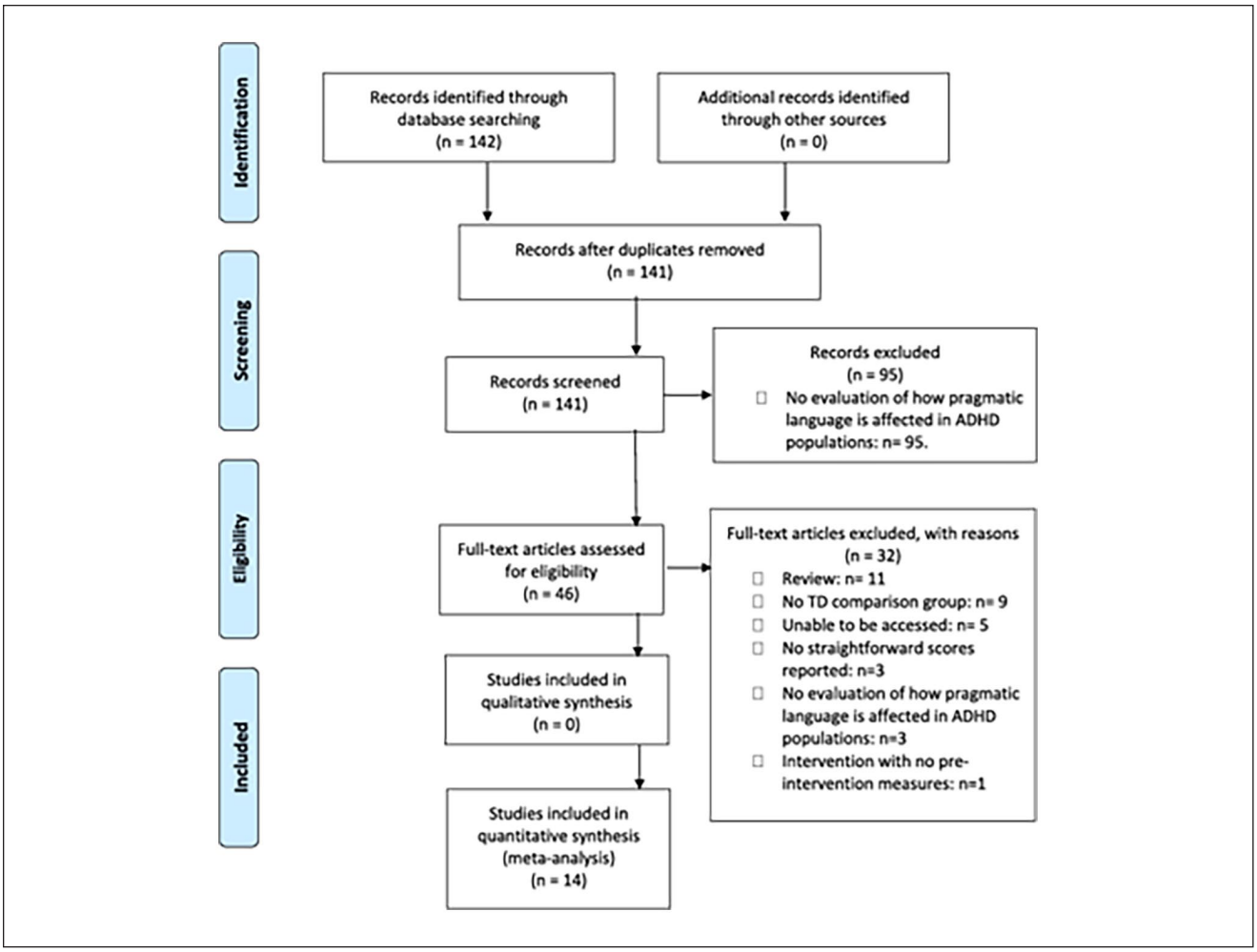

Figure 1. PRISMA flow diagram of literature search.

Meta-analysis showed that populations with ADHD showed significantly lower pragmatic ability (Standard Mean Difference [Hedge's G]) = −1.55; 95% CI [−1.93, −1.18]; $p < .0001$; Figure 2), compared to TD population. No publication bias was detected by rank correlation, Egger's regression, and trim and fill tests.

Discussion

We aimed to examine the effects of ADHD on pragmatic language deficits as compared to TD populations by conducting a meta-analysis of studies on the topic. Meta-analysis indicated an effect size of −1.55, a magnitude classified as very large, conclusively demonstrating that ADHD populations show significantly lower pragmatic language abilities than their TD counterparts.

In every study included in the meta-analysis, the ADHD group showed poorer pragmatic language compared to the TD group. While two of the studies had results that did not reach statistical significance, both found that ADHD pragmatic skills were poorer than the TD group to some degree. Further, these two studies had the smallest numbers of participants of all studies included in the analysis, which may well have negatively affected the results and their reliability. All other studies included in the meta-analysis showed a significant difference.

The very large effect size provides conclusive evidence that pragmatic language is indeed significantly impaired in ADHD populations. These results support and expand upon many of the results found in the studies in our analysis, including the study by Parke et al. (2021) that found moderate-to-large effect sizes characterizing children with ADHD's lower scores on a range of pragmatic language measures. Children with ADHD have previously been found to be rated lower in pragmatics by parents and teachers than TD children and only slightly better than children with ASD (Bishop & Baird, 2001), despite pragmatic language not being emphasized as an impairment in ADHD. The current study suggests that pragmatic language impairment in ADHD may require more attention.

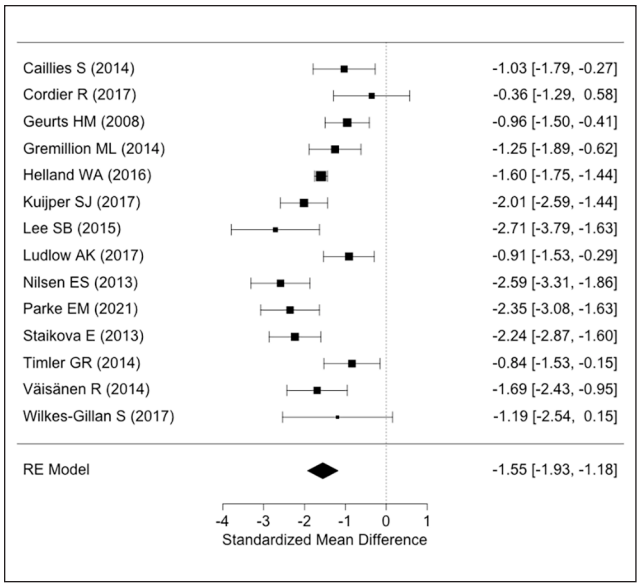

Figure 2. Forest plot for pragmatic language in TD versus ADHD.

Emphasizing pragmatic language abilities is undeniably important due to the necessity of these skills in everyday life, in both social and academic situations (Westby & Cutler, 1994). Addressing any deficits in this domain is therefore essential because of the link between these deficits and a higher risk of various socio-emotional issues throughout life (Jerome et al., 2002). Considering the crucial role these skills play in everyday life and socio-emotional well-being, along with the confirmation from our results that ADHD populations struggle significantly with them, it is clear that they should be addressed as a regular component of ADHD management.

Firstly, pragmatic language skills should be evaluated and assessed as part of routine diagnostic procedures for ADHD. They should also be examined in any children and adults who have already been diagnosed with ADHD who have not yet had their pragmatic language assessed. Treatment plans for ADHD should address pragmatic skills and should be tailored to the specific client's needs in this area using a variety of methods to help them best succeed. Finally, our results emphasize the general need for better awareness of the pragmatic language deficits in ADHD populations so that these recommendations can be carried out effectively.

Limitations of the current study need to be addressed. Given the specific focus of our meta-analysis, we did not examine the treatment of ADHD and its deficits in our study. It would be beneficial for future research to focus on this aspect. It is unknown whether existing treatment ameliorates pragmatic language impairment or if specific interventions are also needed for pragmatic language. Also, our meta-analysis includes studies that examine pragmatic language only at one point in the participants' lives or only over a short period of a few months. Therefore, there seems to be a need for longitudinal research to more fully examine the quality of these skills in ADHD populations over the lifespan.

To our knowledge, the present study represents the first meta-analysis of pragmatic language abilities in ADHD. Our results provide definitive evidence that there are significant pragmatic language weaknesses in ADHD despite differences in measures used and degrees of deficit found across multiple individual studies. The magnitude of these deficits has implications for the understanding and management of ADHD, including assessment throughout all stages of diagnosis and treatment, client-centered methods tailored to individual needs, and better awareness of these challenges in general. More research is needed to determine best treatment practices to address pragmatic language in ADHD along with longitudinal patterns of social language skills in ADHD.

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Author Contributions

Both authors designed and conducted the study. The initial manuscript was written by PBK and edited by TI.

Declaration of Conflicting Interests

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Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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