

REVIEW

Social Functioning in Youth with Attention-Deficit/Hyperactivity Disorder and Sluggish Cognitive Tempo

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The current review summarizes the research to date on social functioning for youth with attention-deficit/hyperactivity disorder (ADHD†) with a focus on three key domains: peer rejection, friendship, and social information processing. The review extends past reviews by examining the research to date on how the presence of sluggish cognitive tempo (SCT) symptoms, a common correlate of ADHD, affects the social presentation of youth with ADHD. Overall, youth with ADHD show significant difficulty with peer rejection, forming and maintaining friendships, and abnormalities in how they process and respond to social information. Further, the presence of SCT symptoms results in great social withdrawal and isolation. Future studies are needed to better understand the social difficulties of youth with ADHD, particularly using experimental approaches that can manipulate and isolate mechanisms within the social information processing model. In addition, novel intervention approaches are needed to more effectively ameliorate the social difficulties of youth with ADHD and those with co-occurring SCT symptoms.

Attention-deficit/hyperactivity disorder (ADHD) is a neurodevelopmental disorder commonly diagnosed in childhood that typically presents with symptoms of inattention, hyperactivity, and impulsivity [1]. Children with ADHD experience multiple impairments in daily life. In particular, social difficulties are among the most pervasive impairments [2,3]. This is concerning given that social functioning plays an important role in the long-term outcomes of typically developing children [4,5]. Further, for children with ADHD, it is one of the strongest predictors of long-term outcomes and comorbidity [6-8]. In the current review, we focus on the following key domains in

which children with ADHD have social impairments: peer rejection, friendship, and social information processing. While there are additional domains that could be considered in our review (*e.g.*, social skills, peer victimization, etc.), we chose to focus on these three domains given the importance of both peer rejection and friendship for child adjustment and how social-information processing can serve as a helpful framework for better understanding *why* children with ADHD may struggle with social functioning. Further, past reviews have provided less coverage of friendship even though research continues to show the important role that friendship plays for children

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†Abbreviations: ADHD, attention-deficit/hyperactivity disorder; SCT, sluggish cognitive tempo; SIP, Social Information-Processing.

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with ADHD [3,9,10]. Finally, we review the emerging literature on sluggish cognitive tempo (SCT) symptoms, a common correlate of ADHD, and their relation to social impairments to better understand the unique social impairments of those who present with such symptoms.

PEER REJECTION

Peer rejection is a social process measured by the extent to which the peer group dislikes a child [11]. Many children with ADHD (50 to 80 percent) are rejected by their peers, and opinions about children with ADHD are stable even after treatment [12,13]. Research suggests that peer rejection develops quickly in new situations and peers' opinions are not easily changed [13]. For example, children with ADHD are evaluated and rejected by peers within the first 30 minutes of interacting with them [14]. In addition, a child with ADHD has almost a half-million negative interpersonal interactions each year [15]. Features of children with ADHD have been found to be associated with more peer rejection [16]. Children with ADHD more often interrupt others and have difficulty sustaining conversations [17]. In a summer camp setting, difficulty paying attention, breaking rules, and complaining predicted higher rates of peer rejection for children with and without ADHD [16]. Lastly, children with ADHD are more impulsive than their peers, and their negative behaviors occur more often in unstructured environments [e.g., play; 18].

Longitudinal studies have also examined the effects of ADHD in relation to peer rejection over time. Childhood ADHD symptoms predict more peer rejection in adolescence [19], lower academic achievement, and a higher likelihood of eating disorders, internalizing, and externalizing problems in adolescent girls with ADHD [20]. Further, peer rejection in elementary school predicts cigarette smoking, delinquent behavior, anxiety, and global impairment in adolescence [8]. These children continue to show impairment in social functioning and are more often disliked by their peers even when they no longer meet criteria for ADHD in adolescence [21].

FRIENDSHIP

Friendship is a multifaceted construct that is generally defined by the following: each member confirming the friendship exists, the friendship mainly comes from a mutual fondness for each other, and the friendship is voluntary [22]. It must be considered within a developmental context, as there are many social and cognitive changes throughout childhood and adolescence such as emotion regulation and social skills [23]. Friendship is associated with school-related variables, such as involvement at school [24] and academic achievement [25,26]. Friend-

ship is related to positive adjustment [22] and loneliness [27,28], internalizing and externalizing problems [29], and self-esteem [30]. Additionally, it has been shown to buffer effects of peer victimization for children who are at risk [31].

Research on friendship in children and adolescents with ADHD has investigated friendship quality, characteristics of a friend, and the stability of friendships. Studies comparing children with and without ADHD show meaningful friendship differences; in general, children with ADHD have fewer close friends and more difficulty maintaining friendships [19,32,33]. Children with ADHD have been shown to have fewer reciprocal friendships in a summer camp setting, such that girls with ADHD have fewer friends compared to girls without ADHD [34,35]. Interestingly, children with ADHD do not nominate fewer children as friends but fewer of their nominated friends are confirmed by parent or teacher report [33,36]. When children with ADHD do have reciprocated friendships, they report worse friendship quality and more conflict [37]. This could be reflected in the partners that they choose as friends. For example, children with ADHD often have friends who also have symptoms of ADHD and oppositional behavior. This may be due to mutual engagement in sensation-seeking activities, because both children lack age-appropriate social behavior, or due to peers' negative views about them [37]. This pattern of having more friends with ADHD and behavior problems could be problematic given research showing the negative influences of having a friend with behavior problems [38,39].

In relation to friendship maintenance, children with ADHD experience greater loss of friendship over time than their typically developing peers [40]. For example, one study showed that children with ADHD have an average length of friendship lasting 9 to 14 months shorter than typical children's friendships [33].

Research has also examined differences in how children with ADHD interact with their friends. Children with ADHD show a similar amount of contact with their friends over the phone, but they spend less time with their friends outside of school [33]. When engaging in negotiation tasks with friends, children with ADHD are more dominant and present more insensitive and selfish proposals compared to typical children [37].

Beyond concurrent relations, childhood ADHD also predicts friendship impairment longitudinally. One study of adolescents with ADHD found that five years later, baseline ADHD symptoms predicted social impairment and friendship functioning [19]. Specifically, early adolescent ADHD predicted fewer close friendships, trouble maintaining friends, more peer rejection, and less involvement in school or community activities with friends in late adolescence and young adulthood [19,32].

However, some studies have explored protective factors of friendship in children with ADHD, and have found mixed results. Cardoos and Hinshaw (2011) examined girls with and without ADHD before and after a 5-week summer camp. They found the presence of a mutual friend was a buffer for peer victimization, and it remained a protective factor even if the mutual friend had ADHD and the friendship was of lower quality [41]. Mrug and colleagues (2012) examined social functioning in children with ADHD in treatment 6 and 8 years after baseline measures. They found the presence of a mutual friend in childhood was not associated with long-term outcomes, and it was not a protective factor for peer rejection [8].

SOCIAL INFORMATION PROCESSING

Given the difficulties with peer rejection and friendship reported so far, it is important to consider *why* children with ADHD struggle with peer rejection and friendship. One of the primary domains impaired in children with ADHD is social information processing [3]. The Social Information Processing (SIP) model, initially outlined by Crick and Dodge (1994), has at least six well-defined steps: encoding of cues, interpretation of cues, clarification of goals, response access or construction, response decision, and behavioral enactment. Research suggests that children with ADHD primarily show impairment in the steps of encoding, identifying problems, and generating responses in problem-solving [42], the latter two likely resulting from difficulties at any point in steps two through six of SIP. Though research directly examining specific steps of SIP and ADHD is relatively scarce, research on a few areas – encoding, interpretation of cues, and behavioral enactment – helps provide insight into the social difficulties found in ADHD. We review those areas below.

In relation to the first step of SIP, encoding of cues, children with ADHD tend to encode fewer social cues than comparison children when presented with vignettes [43,44]. Examination of these errors reveals a nonsystematic pattern, suggesting impairment stemming from inattention rather than attentional bias [43,45,46]. This conclusion is further supported by studies showing that attention problems mediate relationships between foundational executive skills and social outcomes in children with ADHD [47,48], suggesting a theoretical pathway of executive dysfunction driving attention problems which lead to difficulty with encoding and subsequent social problems. This potential pathway warrants further empirical examination.

In addition to encoding difficulties, children with ADHD also have difficulty with emotion recognition. Emotion is hypothesized to interact at each step of SIP [49]. A review of social cognition in ADHD found ev-

idence of incorrect identification of emotions when children are presented with either pictures of faces or spoken sentences [50]. Other studies also support difficulties with understanding facial expression of emotions [51,52]. Similar to research on social encoding, some research suggests that these emotion identification errors may be random [45], while other studies suggest that emotion identification errors may be specific to emotions such as anger and fear [53]. Further, a recent study found that children with ADHD show an atypical brain-related response (as indexed by the N170 event-related potential) when presented with fearful faces, suggesting that children with ADHD may exhibit abnormal fear processing [54]. Future research should continue to examine the role that emotion recognition plays within the SIP model for youth with ADHD.

Another step in the SIP model is the interpretation of cues. An example of such an interpretation problem is what has been termed a positive illusory bias [3]. Despite extensively documented social difficulties, children with ADHD do not rate themselves as having problems with peers [55,56]. They continue to rate themselves as socially competent even though parents and teachers report significant social problems [56]. This bias may interfere with their friendships when children with ADHD do not report problems in the relationship, but their friend reports issues [40]. Research shows that children with ADHD and a positive bias are rated as less friendly, more inattentive, and less engaged than children with ADHD without the bias as well as typically developing children [57].

There are several hypotheses for this phenomenon [56]. It can be explained as cognitive immaturity in which younger children tend to overestimate their abilities [58]; however, some studies have shown that children with ADHD do not overestimate their performance in other domains [e.g., academics; 59]. Executive function deficits may play a role in adequate self-monitoring and perspective taking abilities [60,61]. Another theory is that the positive illusory bias is a self-protective factor for children with ADHD. Studies have demonstrated this in showing that children with ADHD do not overestimate the abilities of others [62] and tend to overestimate their abilities in areas that are the most difficult for them [63]. Further, children with ADHD do not overestimate others' competence but continue to inflate their own competence [62]. More research is needed in this area, particularly using experimental methods, to better understand *why* children with ADHD exhibit this bias. For example, Hoza, Waschbusch, Pelham, Molina, and Milich [2000; 64] utilized an experimental approach where children with and without ADHD experienced either success or failure during a social interaction task with a confederate. Children with ADHD generally rated their success during this task as higher than children without ADHD

despite being rated as less effective by objective observers. Importantly, this effect was found even in the failure condition in which the confederate was sending clear signals of disinterest. Additionally, children with ADHD are more likely to interpret social situations using the most recent contextual information, which may be suggestive of either shallow encoding or difficulty in the interpretation stage of SIP [65]. Following interpretations, the SIP model focuses on behavioral enactment. Given the known deficits of children with ADHD (*e.g.*, impulsivity, inhibitory control problems), children with ADHD often struggle to implement appropriate behavioral responses in social dilemmas and these responses are likely affected by earlier steps in the SIP model. For example, children with a positive illusory bias have been shown to be less friendly, responsive, and engaged in a laboratory paradigm compared to children without ADHD and children with ADHD without a positive illusory bias [57]. There is also evidence that a positive illusory bias may result in greater risk for aggressive behavior [66], suggesting that this bias has implications for a range of negative behaviors in social interactions.

In summary, children with ADHD struggle to encode social information due to attentional deficits (which may be partially related to underlying executive functioning deficits) and additional problems with appropriately recognizing emotions in others. Further, they often show an atypical pattern of interpretation of cues that results in an overly positive self-view in social interactions. These difficulties are compounded by the behavioral regulation difficulties of children with ADHD.

SLUGGISH COGNITIVE TEMPO

SCT represents a constellation of symptoms reflecting sluggishness, mental foggy or confusion, excessive daydreaming, losing one's train of thought, and slowed behavior/thinking. SCT symptoms were initially identified in an effort to better understand ADHD symptom profiles and impairments often associated with the disorder [67,68]. While early research involving SCT focused on the utility of the symptoms in differentiating ADHD subtypes [69,70], it has since evolved to exploring the relationships SCT symptoms have with various psychiatric symptoms and domains of functioning [71]. In the context of social functioning, studies have examined the interplay between SCT and ADHD symptoms [69,72] as well as the associations that are unique to each of these constructs [68,73]. Carlson and Mann (2002) and Marshall et al. (2014) compared youth with ADHD and different levels of SCT on social functioning. Together, these studies highlighted that youth with ADHD and high SCT present as more socially withdrawn than youth with low SCT. Further, Willcutt et al. (2014) demonstrated that

while SCT and inattention symptoms were broadly associated with social problems, SCT symptoms were specifically related to social isolation. More recently, Becker et al. [2017; 74] found that the social difficulties associated with SCT are mainly due to isolation, social withdrawal, and low initiative in social situations. Further, Rondon et al. (2018) found that when considered along with other symptoms, SCT remained a significant predictor of parent-reported social withdrawal, whereas attention problems emerged as a significant predictor of broader social problems [73]. Overall, it appears that SCT symptoms are uniquely related to social withdrawal, isolation, and low initiative in seeking out social relationships. While this line of research continues to develop, it will be important to better understand the link between SCT and social functioning and how intervention approaches may be modified in the presence of SCT symptoms.

SUMMARY

While much has been learned about the social difficulties of youth with ADHD, more research is needed to better understand the mechanisms that underlie the connections among ADHD, SCT, and social dysfunction. In addition, more research is needed on key moderators of the effects summarized in the current review (*e.g.*, age, gender, symptom severity, etc.) to better understand how these moderating variables may either increase or decrease the negative social impacts of ADHD. In relation to social-information processing, experimental approaches that manipulate components of the SIP process may be valuable in better understanding the conditions in which children with ADHD show atypical information processing. In addition to experimental research, novel intervention studies are also needed. While social skills training interventions have shown limited efficacy for youth with ADHD [75], other interventions focused on improving peer acceptance of children with ADHD have been more promising [76]. Interventions addressing the broader peer group and social contextual factors, such as parent friendship coaching and making socially accepting inclusive classrooms (MOSAIC) are important to consider given research showing that peers continue to rate children with ADHD negatively after our current treatment approaches [76,77]. Given the strong link between executive function difficulties and social functioning, interventions combining approaches designed to boost executive function in combination with skills training may potentially be more fruitful [78]. Finally, very little is known about interventions for those with SCT, but one past study of children with the Predominantly Inattentive Type of ADHD found evidence that a skills-based intervention with a significant social skills component was effective for improving both SCT symptoms and social functioning [79]. More studies

are needed to evaluate the efficacy of social interventions for youth with SCT as well as other approaches that are theoretically and empirically linked to the SCT profile (e.g., behavioral activation to affect social withdrawal).

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