Why is it Hard Being a Friend While Playing? Relations of Cognitive Functioning in a Controlled Environment to Friendship in Children with ADHD in comparison to Typically Developed Children

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Abstract

ADHD (Attention Deficit Hyperactive Disorder) is a disorder characterized by inattention and hyperactive deficits (DSM-V; APA 2013). The disorder influences various domains including social and cognitive functioning (Barkley, 2003). Children with ADHD show lower quality of friendship have fewer friends and suffer from peer rejection (Normand et al., 2013). Cognitively they show impaired inhibitory control (Barkley, 1997) and difficulty to recognize the emotions of others (Nijmeijer et al., 2008).

To better understand the challenges faced by children with ADHD during friendly interactions, we tested their cognitive inhibition capabilities (i.e. interference control, cognitive inhibition and response inhibition) and social cognitive functions (i.e. emotion recognition) compared to typically developing children, and examined how these skills relate to social performance during an encounter with a friend.

42 pre-adolescents between the ages of 11-13 with ADHD (28.6% females) and 24 typically developed pre-adolescents in the same age range (29.2% females) participated in the study. We focused on pre-adolescence as it is a period in which children are preoccupied with their peers and take part in more social interactions (Sullivan, 1953). Both participants in the friendship dyad considered one another as close friends.

Cognitive inhibition and emotional recognition were examined in a controlled lab setting. For all tasks accuracy and response rate were recorded. In addition, gaze data was collected during the emotional recognition task.

Cognitive inhibition was assessed using three different tasks:

1. The Stroop task (Stroop, 1935; Boonstra et al., 2010). The task examines the ability to focus on a specific stimulus while disregarding from an interfering stimulus (i.e. interference control).

2. The Stop Signal task (Logan & Cowan, 1984). The task examines the ability to withhold an automatic response (i.e. response inhibition).

3. The Goal Neglect task (Duncan, et al., 2008). The task examines the ability to suppress irrelevant information from entering the working memory to free space for relevant input (i.e. cognitive inhibition).

Emotion recognition was examined using the CAM-C (The Cambridge Mindreading Face-Voice Battery for Children; Golan, et.al., 2015). The task examines the ability to recognize facial expressions of emotions. We considered both basic (e.g. happiness and sadness) and complex (e.g. jealousy and disappointment) emotions.

Secondly, we examined inhibition and social cognition skills within a social interaction with a friend. Both friends first completed a self-report inventory on their friendship quality. Subsequently, they competed in a car race (Fonzi, Schneider, Tani, & Tomada, 1997). Participants had to race each other by moving car blocks through a narrow lane, in a limited time while working according to specific rules.

Results indicated that children with ADHD showed poorer accuracy of interference control, response inhibition and cognitive inhibition compared to typically developed children. No differences were found in emotion recognition, however, gaze data indicated that children with ADHD showed ineffective eye fixation pattern compared to typically developed children. Children with ADHD fixated their eyes longer on simple emotions and had shorter fixations on complex emotions. This ineffective gaze fixation pattern may be related to their interpretation and ability to execute a proper action during a social interaction. No differences were found in response time.

When examining inhibition and social cognition during a social interaction with a friend results showed that children with ADHD had a lower rate of pro-social behaviors, less non-verbal behaviors and less affective gestures compared to typically developed children. Moreover, children with ADHD showed less affection, had more negative affect, had less eye contact with their friends and assisted their friends less than the typically developed children. Surprisingly during the competition, children with ADHD, and not typically developed children, tended to play more according to the rules. We assume that this tendency is related to their desire to keep the social relationship and their effort to avoid inappropriate behaviors during the game.

Data also indicated that when children were asked to choose a close friend to participate with in the research, children with ADHD chose a friend with ADHD, while typically developed children chose a typically developed friend. Less than a

quarter of the children chose a friend of the opposite study group. We therefore compared the dyads of friends – the homogenous dyads – two children with ADHD, and two typically developed children, to heterogenous dyads – a child with ADHD together with a typically developed child. It was found that children with ADHD tended to influence the behavior of a typically developed child, while interacting together. That is a heterogenous dyad of child with ADHD and typically developed child showed a low rate of prosocial behaviors, similar to a dyad of two children with ADHD. A homogenous dyad of typically developed children, however, showed a significantly higher rate of prosocial behaviors.

Examining the relationship between inhibition and social cognition, in both a controlled environment and during a friendly interaction, revealed that in children with ADHD, but not in typically developed children, inhibition deficits predict friendship hardships. On the other hand, emotion recognition deficits predict difficulties in friendship among typically developed children, but not in children with ADHD. These findings emphasize how among children with ADHD, inhibition skills are essential for the maintenance of friendship and that interventions focusing on inhibitory control may assist children with ADHD in their relationships with their peers.

Another important finding is that, while children with ADHD can show social cognitive abilities, such as, recognizing emotional facial expressions in a controlled environment, they have difficulties executing those social cognitive behaviors, in a friendship situation, such as pro-social behaviors. It can be assumed that the inefficiency of gaze, and deficits in interference control and response inhibition, may explain the difficulty in executing the proper social response. This relation should be examined directly in future research.