Correlates of social functioning in autism spectrum disorder: The role of social cognition

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ABSTRACT

Background: Individuals with autism spectrum disorder (ASD) experience marked challenges with social function by definition, but few modifiable predictors of social functioning in ASD have been identified in extant research. This study hypothesized that deficits in social cognition and motor function may help to explain poor social functioning in individuals with ASD.

Method: Cross-sectional data from 108 individuals with ASD and without intellectual disability ages 9 through 27.5 were used to assess the relationship between social cognition and motor function, and social functioning.

Results: Results of hierarchical multiple regression analyses revealed that greater social cognition, but not motor function, was significantly associated with better social functioning when controlling for sex, age, and intelligence quotient. Post-hoc analyses revealed that better performance on second-order false belief tasks was associated with higher levels of socially adaptive behavior and lower levels of social problems.

Conclusions: Our findings support the development and testing of interventions that target social cognition in order to improve social functioning in individuals with ASD. Interventions that teach generalizable skills to help people with ASD better understand social situations and develop competency in advanced perspective taking have the potential to create more durable change because their effects can be applied to a wide and varied set of situations and not simply a prescribed set of rehearsed situations.

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1. Introduction

Much of the extant literature on autism spectrum disorder (ASD) has focused on describing the social, cognitive, and functional deficits that are thought to be characteristic of the condition. For instance, we know that individuals with ASD have a number of neurological and behavioral challenges that broadly affect the way that they perceive and receive the social environment (Dawson & Bernier, 2007). In adulthood, studies indicate that individuals with ASD experience widespread problems with social integration, daily living skills, education, employment, and independent living (Anderson, Liang, & Lord, 2014; Gray et al., 2014; Howlin, Goode, Hutton, & Rutter, 2004; Levy & Perry, 2011), which may be driven by challenges...
with social cognition (Baron-Cohen, 1989) and motor function (Travers et al., in press). Thus, overall outcomes for individuals with ASD based on the metrics of becoming self-supporting, living independently, and developing a network of friends have been characterized as poor for the majority of individuals with ASD (Henninger & Taylor, 2013). However, it is also clear that outcomes are more favorable for a small minority of individuals with ASD (Anderson et al., 2014), stressing the importance of understanding factors associated with different outcomes.

A growing body of longitudinal research identifies predictors of social functioning throughout the life course in ASD. In preschoolers, greater symptom severity in early childhood tends to be associated with poorer functioning and lesser gains in skills in childhood (Fountain, Winter, & Bearman, 2012; Hedvall et al., 2015). In adolescents and adults, the best evidence indicates that higher childhood intelligence quotient (IQ) and better childhood language ability predict better adult outcomes (Magiati, Tay, & Howlin, 2014). In adults, preliminary studies suggest that better daily living skills (Bishop-Fitzpatrick et al., 2016; Smith, Maenner, & Seltzer, 2012), better adaptive behavior (Woodman, Smith, Greenberg, & Maillick, 2016), and more vocational engagement (Taylor, Smith, & Maillick, 2014) in adulthood may also be predictive of better outcomes and social functioning. However, it is likely that a wide range of challenges are associated with poor outcomes in ASD beyond those that have been identified in the research literature to date, and more research is needed in order to better understand the link between well-documented social, cognitive, and motor deficits and functioning in individuals with ASD. This is particularly important given movement in the field away from a single cause model and towards a model that accounts for considerable genetic and behavioral heterogeneity (Happé, Ronald, & Plomin, 2006).

Of note, deficits in social cognition may be central to the social impairment that is a hallmark of ASD (Baron-Cohen, 1989). Social cognition refers to cognitive abilities involved in the processing and interpretation of socio-emotional information in oneself and others (Newman, 2001). A large body of social-cognitive research supports the finding that the majority of individuals with ASD have marked impairments in Theory of Mind (ToM), or the ability to attribute beliefs to others (e.g., Baron-Cohen, 1989; Baron-Cohen, Leslie, & Frith, 1985; Happé and Frith, 2006). This research suggests that individuals with ASD experience a specific developmental delay in social cognition (Baron-Cohen, 1989) that may be particularly pronounced in early development (Baron-Cohen, Joliffe, Mortimore, & Robertson, 1997). Classic experiments that target ToM in children with ASD through first- and second-order false belief tasks have found that individuals with ASD have marked deficits in both the ability to think about another person’s thoughts about an objective event (first-order false belief; Baron-Cohen et al., 1985) and the ability to think about another person’s thoughts about a third person’s thoughts about an objective event (second-order false belief; Baron-Cohen, 1989). However, evidence does indicate that some individuals with ASD without delays in language development pass first- and second-order false belief tasks (Baron-Cohen et al., 1997), suggesting the need to more fully explore the impact of social cognition on functioning.

These categorical challenges in social cognition likely play out in a number of impactful ways in the lives of individuals with ASD. Research on typically developing individuals and non-ASD clinical populations suggests an association between social cognition and functioning. For instance, Fink, Begeer, Peterson, Slaughter, and de Rosnay (2015) found that typically developing children with mutual friends outperformed typically developing children without a mutual friend on a battery of ToM tasks, indicating that poor social cognition may be associated with a lack of quality friendships in childhood. Additionally, a meta–analysis of the impact of social cognition on functioning in schizophrenia found that social cognition was strongly related to functional outcomes, with the strongest associations being between ToM deficits and functional outcomes (Fett, Viechtbauer, Penn, van Os, & Krabbendam, 2011). Recent research indicates that adults with ASD and adults with schizophrenia are quite similar in their social cognition profiles (Couture et al., 2010; Eack, Bahorik et al., 2013) and often fail to pass first- and second-order false belief tasks like individuals with ASD (Bora, Yucel, & Pantelis, 2009), suggesting that these associations found in schizophrenia may also hold in individuals with ASD.

Deficits in social cognition may not fully account for deficits in social functioning in ASD, particularly in higher functioning individuals (Frith, 1997), and may be further compounded by a number of associated factors (i.e., motivational, perceptual, and emotional challenges) as well as broader and more general challenges with motor function (Sumner, Leonard, & Hill, in press). Research indicates that individuals with ASD have poorer motor function, with greater clumsiness, more motor coordination abnormalities, greater postural instability, and poorer performance on standardized tests of motor speed such as the finger tap and grooved pegboard tests, with a large effect size for motor coordination deficits identified by a recent systematic review (Fournier, Hass, Naik, Lodha, & Cauraugh, 2010). Recent findings indicate that motor coordination deficits may be neurobiological in nature. More specifically, differential activation in brain areas related to motor speed suggesting a reliance on alternative motor pathways is likely (Verhoeven, De Cock, Lagae, & Sunaert, 2010), especially on more difficult motor tasks (Duffield et al., 2013), and poorer motor function may be associated with atypical white matter microstructure in the brain stem (Travers et al., 2015).

Motor function and social cognition may be intrinsically linked. Indeed, how we think about the actions of others and engage in social interactions with them likely arises from our ability to synchronize motor actions with our own communication and to correctly interpret the co-occurrence of motor movements (gestures) with social communication, or social synchronization (Sommerville & Decety, 2006). In ASD, early motor delays and motor clumsiness may limit the social opportunities of young children, thus reducing opportunities to practice social cognition (Meltzoff, 2007; Sommerville & Decety, 2006). Core impairments with interpreting the social cues of others may also limit motor learning in ASD (Dawson & Bernier, 2007), as many motor skills are learned by watching others (Travers et al., 2015). The connection between motor function and social cognition in ASD may be evidenced by impairments in social synchronization, or the ability of two people to communicate while taking turns appropriately and match each other’s gestures and body language (Feldstein,
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