

Social cognition as a mediator of cognition and outcome among deaf and hearing people with schizophrenia

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Abstract

It has been suggested in the research literature that facial affect processing (FAP) and theory of mind (ToM) are both potential mediators of the well-established relationship between cognition and functional outcome among people with schizophrenia. The current project tests the mediating potency of these two domains of social cognition among deaf and hearing people with schizophrenia. Sixty-five people (34 deaf, 31 hearing) were assessed using measures of verbal and visual memory, attention, visual processing, FAP, and ToM. The results suggest that each domain of cognition, save vigilance, exerts an effect on functional outcome indirectly through its influence on social cognition. The patterns of mediation varied when the samples were broken down by hearing status and analyzed separately. Namely, the cognitive tasks directly involving *linguistic* ability (early visual processing [EVP] and word memory) were best mediated by social cognition for hearing subjects. For deaf subjects, the *nonlinguistic* cognitive tasks (e.g., visual–spatial memory-recall and copy [VSM-recall and VSM-copy]) were best mediated by social cognition. While FAP and ToM were equally effective as mediators for hearing subjects, FAP was a more potent mediator than ToM for deaf subjects. This study extends prior work in the area of social cognition and schizophrenia and indicates that the development of cognitive rehabilitation strategies should include not only interventions targeting specific cognitive abilities, such as attention and memory, but should include an emphasis on social–cognitive domains, including FAP and ToM. Further, deaf and hearing subjects may benefit from interventions addressing aspects of cognition that support linguistic ability, especially as they relate to social cognition.

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1. Introduction

Social cognition represents the domain of cognition that involves the perception, interpretation, and proces-

sing of social information (Ostrom, 1984, p. 176). It is conceptualized as non-redundant with *nonsocial* cognition, which involves the processing of numbers, letters, and inanimate objects (e.g., visual–spatial memory). Social cognition has become a high priority area for the study of schizophrenia. The NIMH initiative Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) (Nuechterlein et al., 2004) identified social cognition as one of 7 cognitive domains

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that are critical for an understanding of schizophrenia. Subsequently, recommendations from an NIMH meeting in March 2006 identified research directions for the role of social cognition in schizophrenia. Two aspects of social cognition that were noted as being particularly relevant were the ability to understand another person's intentions (i.e., to possess a theory of mind [ToM]) and the ability to decode affective facial expressions. ToM and facial affect processing (FAP) are hypothesized to influence real-world behaviors more directly than do cognitions involving the manipulation of abstract information (Couture et al., 2006; Gur et al., 2006; Penn et al., 1996; Pinkham and Penn, 2006). This is consistent with findings that performance on social-cognitive measures accounts for variance in functional outcomes over and above that accounted for by traditional cognitive measures (Green et al., 2004, in press; Mayer et al., 2001). The current study explores the assumption that functional outcomes will be better explained by understanding relationships *between* nonsocial and social cognition. In particular, it is hypothesized that social cognition mediates the relationship between cognition and functional outcome.

Evidence for the role of social cognition as a mediator of cognition is largely indirect. Correlational studies have found a link between social cognition and cognition in schizophrenia. In particular, emotion perception has been associated with early visual processing (Addington and Addington 1998; Corrigan et al., 1994; Kee et al., 1998; Sergi and Green 2003), verbal memory (Corrigan et al., 1994) and vigilance (Addington and Addington, 1998; Bryson et al., 1997). The relationship between social cognition and functional outcome has been studied less often; however associations have been found between ToM and functional status (Roncone et al., 2002) as well as social cue perception and functional status (Corrigan and Toomey, 1995; Kee et al., 2003; Mueser et al., 1996; Penn et al., 1996). Sergi et al. (2006) conducted a direct test of the mediating hypothesis and found that social perception mediated the influence of early visual processing on functional outcome.

While no empirical data exist regarding social cognition or its relationship with cognition and functional outcome among deaf people with schizophrenia, the domain has been extensively investigated among non-clinical deaf children. The focus on nonclinical populations extends from the natural experiment created by deaf people born to hearing parents (90% of the deaf population). Rich literature exists regarding the attainment of linguistic and social-cognitive milestones among deaf children (including FAP and ToM), the effects of delayed language acquisition, and the neural

organization of American Sign Language (ASL). A summary of results related to social cognition and deafness are presented in section 1.1.

Cognitive domains that have consistently proven to predict functional outcomes among hearing people with schizophrenia were only recently evidenced in a sample of deaf people with schizophrenia (Horton and Silverstein, 2007a,b). A purpose of this paper is to extend this work to include an investigation of social cognition among deaf people with schizophrenia.

1.1. Social cognition and deafness

1.1.1. Theory of mind

The finding that deaf children from hearing families acquire a ToM later than do hearing children from hearing families (13–16 versus 3–7 years old) has been consistently replicated (Russell et al., 1998; Peterson and Siegal, 1995, 1997, 2000). Deaf children from deaf families on the other hand, acquire a ToM during the same developmental period as their hearing counterparts, revealing that the modality in which language acquisition occurs (visual-spatial versus oral-aural) is irrelevant with regards to this particular cognitive achievement. As long as language input is *early* and *complete*, signing and speaking children perform equally on ToM tasks (Schick et al., 2007 p. 392).

It is now widely agreed that deaf children from hearing families are most appropriately described as being subject to a developmental delay rather than permanent disability. Accurately inferring intentions is closely related to an early experience with language (Frith, 1994; Moeller and Schick, 2006; Russell et al., 1998) and conversational experience seems crucial to its timely acquisition. The opportunity to share thoughts, beliefs, desires, and fantasy play with at least one fluently signing conversational partner at home appears to protect deaf children from a delay in the acquisition of a ToM that occurs among deaf children in households without a fluent signer (Peterson and Siegal, 1997). As such, a causal role likely exists between age of language acquisition and development of a theory of mind (de Villiers, 2005; Schick et al., 2007).

Based on the nonclinical literature investigating deaf children, an association between linguistic ability and ToM was expected, and found, among the current deaf sample ($r=.614$, $p=.000$). The analysis of specific aspects of linguistic ability in relation to ToM will be addressed in a forthcoming paper; yet, the special issues related to language acquisition and inferring intentions were evident in the current project. For example, the deaf subjects who learned language early and deaf subjects with superior linguistic ability scored higher on the ToM measure compared to late learners and those with weaker

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