Social Cognition in Schizophrenia

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Abstract
Social cognition has become a rapidly growing area of schizophrenia research. Individuals with schizophrenia show substantial and persistent impairments in a range of social cognitive domains, including emotion processing, social perception, attributional bias, and theory of mind. The social cognitive impairment in schizophrenia is associated with, but separable from, impairments in (nonsocial) neurocognition such as attention, memory, and problem solving. Social cognition is a key determinant of functional disability of schizophrenia; it acts as a mediator between neurocognition and functional outcome, and it contributes unique information about functional outcome beyond that provided by neurocognition. Efforts to develop interventions to improve social cognitive impairments through new pharmacological and training approaches are under way.

Keywords
schizophrenia, social cognition, neurocognition

Despite advances in antipsychotic medications, schizophrenia remains one of the most disabling illnesses for adults all over the world. Recently, the treatment of schizophrenia has shifted fundamentally from a focus on reducing symptoms to a focus on recovery and improving aspects of functioning. Recovery-oriented treatments require identifying the determinants of functioning in schizophrenia, and these include the disorder’s characteristic cognitive impairments. Although (nonsocial) neurocognition (e.g., attention, memory, speed of processing, problem solving) has been a long-standing focus in schizophrenia research, social cognition has emerged more recently as a high-priority topic for exploration. Social cognition generally refers to the mental operations that underlie social interactions, including perceiving, interpreting, and generating responses to the intentions, dispositions, and behaviors of others (Fiske & Taylor, 1991; Kunda, 1999). Social cognition includes the ways in which we decipher an emotion on another person’s face and how we draw inferences about another’s intentions.

Research on social cognition in schizophrenia has expanded exponentially over the past 5 to 10 years and now clearly indicates that this disorder is characterized by substantial, wide-ranging social cognitive impairments.

Social cognition research in schizophrenia has addressed several different goals, including (a) to understand social cognition’s role in functional outcome in schizophrenia; (b) to better understand the development of particular clinical symptoms of schizophrenia such as paranoia; (c) to examine the trait versus state aspects of social cognitive impairment, for example, examining social cognitive performance over phases of the illness or in samples at risk for schizophrenia; (d) to apply methods from social neuroscience to identify aberrant neural substrates in schizophrenia that are potentially specific for processing of social information; and (e) to evaluate both psychopharmacological and psychosocial interventions for social cognitive impairment. In this article, we briefly describe the primary domains of social cognition that have been examined in schizophrenia and then summarize findings on the first and last of these goals—namely, the relationship between social cognition and functional outcome and approaches to intervention for social cognition.

Social Cognitive Domains
Domains in the schizophrenia literature

Social cognitive research in schizophrenia has tended to fall into four main areas: emotion processing, social perception, attributional bias, and theory of mind (Green, Olivier, Crawley, Penn, & Silverstein, 2005; Green et al., 2008; Penn, Addington, & Pinkham, 2006). These domains capture the way the field is...
covered in the literature and are not generally considered to be fully separable subprocesses. The boundaries between these areas are blurry, and there is overlap. In addition, some of the areas (e.g., emotion processing) are themselves routinely divided into subprocesses in studies with healthy subjects. Nonetheless, this listing of domains captures the current state of the schizophrenia research literature and maps reasonably well onto other models of social cognition that are based on neuroimaging findings in healthy samples (Ochsner, 2008).

**Emotion processing**

Emotion processing refers broadly to perceiving and using emotions adaptively. One influential model of emotional processing defines emotional intelligence as a set of four components: identifying emotions, facilitating emotions, understanding emotions, and managing emotions (Mayer, Salovey, Caruso, & Sitarenios, 2001). This model includes affect perception, a domain of emotion processing that is frequently measured in schizophrenia research. Measures of emotion processing vary broadly and include ratings of emotions that are displayed in faces or voices or ratings of how individuals manage, regulate, or facilitate emotion based on their responses to brief written or videotaped vignettes of people interacting.

**Social perception**

Tests of social perception assess an individual’s ability to identify social roles, societal rules, and social context. In social perception tasks, participants must process nonverbal, voice intonation, and/or verbal cues to make inferences about complex or ambiguous social situations. Individuals may be asked to identify interpersonal features in a situation such as intimacy, status, and mood state. Social perception can include “relationship perception,” which refers to perception of the nature of relationships between people as opposed to perception of individuals acting alone.

**Attributional bias**

Attributions are causal statements that either include or imply the word “because.” Attribution bias or style reflects how people typically infer the causes of particular positive and negative events. Attributions can be measured by questionnaires or rated from transcripts of interactions. In research involving both psychiatric and nonpsychiatric samples, key distinctions between external personal attributions (i.e., causes attributed to other people), external situational attributions (i.e., causes attributed to situational factors), and internal attributions (i.e., causes attributed to oneself) are typically made.

**Theory of mind**

Theory of mind (also called mental-state attribution or mentalizing) refers to the ability to infer the intentions, dispositions, and beliefs of others. Much of the initial interest in this area focused on studies of children and how theory of mind is acquired in normal and abnormal development. Hence, many measures in this area were initially developed for use with children and then had to be adapted for use with adults. Theory of mind has been extended to schizophrenia partly due to similarity between aspects of social dysfunction in autism and those in some patients with schizophrenia. Commonly used tasks in this area involve responding to questions about brief social vignettes or arranging cartoon panels into a sensible order to demonstrate one’s understanding of perspective taking, nonliteral language such as sarcasm, or deception.

**Magnitude of the impairment**

The magnitude of the differences between patients and controls on social cognitive tasks is substantial. A recent review of 86 studies using various emotion-perception tasks reported an overall large difference between groups: an effect size of .91 (Kohler, Walker, Martin, Healey, & Moberg, in press). Similarly, a review of theory of mind examined more than 30 studies and reported large differences, with effect sizes ranging from .90 to 1.25 (Bora, Yucel, & Pantelis, 2009). Although research has been conducted primarily with chronically ill patients, several studies have reported social cognitive impairments in unmedicated or recent-onset patients. Further, the differences are relatively stable across acutely symptomatic and remitted states and across phases of the illness. Hence the social cognitive impairments in schizophrenia are likely core features of the illness and not simply a result of medication side effects or clinical episodes.

**Distinctiveness of neurocognition and social cognition**

If the overlap between neurocognition and social cognition in schizophrenia were very large, it would raise questions about the value of considering the two domains separately. The distinction between these two areas depends mainly on the types of stimuli (e.g., people or faces vs. objects) and the types of judgments being made (e.g., attributing mental states to other people vs. basic tests of attention, speed of processing, or memory). Neurocognitive and social cognitive tasks often share cognitive processes, such as working memory and perception, and therefore are clearly associated. However, several studies using specialized statistical methods (e.g., confirmatory factor analyses) have shown that models fit better when the two domains are separated than they do when they are combined (Sergi et al., 2007). The general conclusion from these studies is that social cognition is associated with neurocognition but not redundant with it. This question about the distinctiveness of neurocognition and social cognition is not specific to schizophrenia research but also applies to social cognitive and social neuroscience research in healthy samples. The conclusion that there is partial overlap in schizophrenia is fully consistent with studies from nonclinical social neuroscience that reveal partially overlapping and partially distinctive patterns of neural
activation between nonsocial and social cognitive tasks (Van Overwalle, 2009).

**Social Cognition and Functioning in Schizophrenia**

A key motivation to study social cognition in schizophrenia is to explain heterogeneity of functional outcome. Level of social cognitive impairment appears to be a key determinant of daily functioning in people with schizophrenia—including functioning in instrumental activities, interpersonal functioning, and vocational achievement. Disturbances in social cognition may be germane to problems in forming and maintaining interpersonal relationships and addressing interpersonal difficulties in work settings. For example, misperceptions during social interactions could adversely impact how people with schizophrenia interpret the behavior of others, which may result in interpersonal conflicts and/or social withdrawal. In support of this expectation, a growing literature demonstrates consistent patterns of association between social cognition and various aspects of community functioning (Couture, Penn, & Roberts, 2006).

**Social cognition as a mediator**

Beyond these replicated correlations, there is increasing support from statistical modeling approaches that social cognitive processes act as key mediators between neurocognition and functional outcome (Addington, Saedi, & Addington, 2006; Brekke, Kay, Kee, & Green, 2005; Sergi, Rassovsky, Nuechterlein, & Green, 2006). Findings from at least eight independent data sets show that social cognition has significant relationships to both neurocognition and to community functioning. Consistent with mediation, the direct relationships between basic cognition and outcome are reduced or eliminated when social cognition is added to a model. This pattern of findings sheds light on the mechanisms through which neurocognition relates to outcome; at least part of that relationship (and sometimes all of it) is due to a pathway that runs through social cognition (see Fig. 1). The mediating role of social cognition suggests that it is a reasonable target for intervention. If neurocognition and social cognition are both determinants of functioning, better functional outcomes may be achieved if intervention is directed at both components. Further, the theoretical proximity of social cognition to community outcome (see Fig. 1) suggests that improvement in this domain may generalize better to daily functioning than may the somewhat more distal neurocognition.

**Incremental validity from social cognition**

Although neurocognition is a determinant of outcome in schizophrenia, most of the individual differences in community functioning among patients remain unexplained. Hence, other determinants will help explain individual differences in functioning above and beyond what is explained by neurocognition (that is, other factors may show incremental validity, because they would provide additional statistical explanation). The observation that social cognition acts as a mediator in models of neurocognition and functional outcome implicates a mechanism by which neurocognition influences outcome, and it appears from several data sets that social cognition contributes incremental validity for functional outcome beyond that provided by neurocognition (e.g., Brekke et al., 2005; Poole, Tobias, & Vinogradov, 2000; Vauth, Rusch, Wirtz, & Corrigan, 2004). Thus, having both types of cognition in models provides a more complete accounting of the variability in daily functioning experienced by patients. Even so, social and nonsocial measures of cognition still do not fully explain individual differences in functioning in schizophrenia, and other likely determinants and mediators of outcome are being explored as well. For example, Figure 1 has a box for negative symptoms of schizophrenia, which include reduced emotional expression (i.e., blunted affect) and reduced ability to enjoy things (i.e., anhedonia).

These two trends in the literature (i.e., social cognition as a mediator and explaining additional variability in outcome) are consistent with the findings mentioned previously—that social cognition is not fully redundant with neurocognition. Because social cognition can itself be parsed into separable domains (emotion processing, theory of mind, etc.), it is possible that future studies will find that each domain provides a separate pathway for mediation leading to daily functioning. In addition, it is possible that some social cognitive domains will explain outcome better than others or will be related to specific domains of outcome (e.g., work versus social functioning). These questions are mainly unexplored. Also unexplored is whether this approach to understanding determinants of real-world outcome in schizophrenia applies to other clinical populations. A few studies with bipolar disorder patients suggest that these relationships may also characterize other major psychiatric disorders.

**Interventions for Social Cognition in Schizophrenia**

The documented associations between social cognition and outcome in schizophrenia have generated considerable interest in the possibility of enhancing social cognitive abilities as a means to ultimately improve real-world functioning. As mentioned earlier, social cognition appears to be more proximal in the chain of causal factors that lead to poor functional outcome than is neurocognition and, hence, could be a better target for intervention. The modifiability of social cognitive impairments has been studied with two distinct approaches: pharmacological interventions and psychosocial interventions. In terms of pharmacological interventions, a handful of studies have examined whether treatment with antipsychotic medications (typically 4–6 weeks) improves performance on social cognitive (usually facial emotion perception) tasks. Results have been mixed, and the larger studies have failed to show effects. However, novel compounds that may target specific neural systems involved in social cognition are an active area.
Recent initiatives by the National Institute of Mental Health (NIMH), such as Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) and Cognitive Neuroscience Treatment Research to Improve Cognition in Schizophrenia (CNTRICS), are specifically designed to stimulate development of cognition-enhancing drugs (Carter & Barch, 2007; Marder & Fenton, 2004). Social cognition is a domain in the MATRICS Consensus Cognitive Battery and is also a focus for CNTRICS. A large number of trials of novel compounds for neurocognition and social cognition are currently under way.

Aside from psychopharmacology approaches, psychosocial treatment approaches also indicate that social cognitive impairments in schizophrenia are amenable to intervention (Horan, Kern, Penn, & Green, 2008). The modifiability of social cognitive impairment is supported by two general types of studies. First, several broad treatment studies have embedded social cognitive training exercises within multicomponent treatment packages aimed at improving multiple treatment targets. These studies range from short term to 2 years of weekly treatment and are often grounded in basic cognitive remediation, with additional training components designed to help training benefits generalize to different aspects of functioning and/or psychopathology. Several broad treatment studies have demonstrated improvements on social cognition measures, often facial affect perception, with benefits of longer treatments found to persist up to 12 months following the conclusion of treatment.

The second psychosocial approach, targeted treatment studies, specifically uses social cognitive enhancement techniques without other intervention components. These studies have predominantly been conducted with inpatient samples, have spanned 12 to 24 sessions, and have been typically administered in small-group formats. Interventions have targeted either a single component (commonly facial affect perception) or multiple components, with some addressing all four of the social cognitive domains described earlier. A variety of novel treatment techniques have been developed; they include computerized facial emotion perception exercises, imitation of emotional expressions, role-play exercises, analysis and discussion of videos of social interactions, identifying and modifying social attributions, and exercises to distinguish facts from guesses about others’ emotions and intentions. The feasibility and efficacy of targeted approaches have been demonstrated by at least six different research groups internationally, with improvements most consistently found for facial affect perception. Recent studies have provided initial evidence that targeted treatments are efficacious in outpatients and that treatment benefits can persist up to 6 months beyond the conclusion of treatment (Horan et al., 2009; Roberts & Penn, 2009).

While encouraging, the existing targeted treatment studies are limited in a few ways. First, there has been a focus on affect...
perception more than on other important social cognitive domains. Second, not enough studies have been fully controlled (i.e., blinded assessments and randomized assignment to treatment groups). Third, few studies have convincingly demonstrated that the interventions generalize to improvements in real-world functioning.

Conclusions
Research on social cognition in schizophrenia has progressed rapidly over the past decade and has provided key insights into why many people with this disorder experience difficulties in daily functioning and in interacting with others. Nonetheless, fundamental questions remain unanswered, including the optimal parsing of social cognitive domains, the relationships between social cognition and negative symptoms, the degree of social cognitive impairment over the course of illness, and whether impairments are relevant particularly to schizophrenia as opposed to other psychiatric disorders. Also unaddressed are measurement issues, such as how to develop tests that have good psychometric properties when used with patients and that are appropriate for repeated assessments in clinical trials.

In models of functional outcome in schizophrenia, social cognitive domains are highly informative as mediators and they uniquely contribute to explaining individual differences in functional outcome. New information on the types and nature of social cognitive impairments in schizophrenia has stimulated the development of novel psychosocial and pharmacological treatments. This emerging work in social cognitive interventions represents a promising new approach that goes beyond the traditional focus on symptom management to include a focus on achieving more complete and satisfying social functioning.

Recommended Reading
Green, M.F., Penn, D.L., Bentall, R., Carpenter, W.T., Gaebel, W., Gur, R.C., et al. (2008). (See References). A summary of the discussion and conclusions at a consensus meeting at NIMH on social cognition in schizophrenia.
Sergi, M.J., Rassovsky, Y., Nuechterlein, K.H., & Green, M.F. (2006). (See References). A study demonstrating that social cognition appears to act as a mediator between neurocognition and functional outcome in schizophrenia, using a statistical modeling approach.

Declaration of Conflicting Interests
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