Social cognition over time in individuals at clinical high risk for psychosis: Findings from the NAPLS-2 cohort

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ABSTRACT

Deficits in social cognition are well established in schizophrenia and have been observed prior to the illness onset. Compared to healthy controls (HCs), individuals at clinical high risk of psychosis (CHR) are said to show deficits in social cognition similar to those observed in patients experiencing a first episode of psychosis. These deficits have been observed in several domains of social cognition, such as theory of mind (ToM), emotion perception and social perception. In the current study, the stability of three domains of social cognition (ToM, social perception and facial emotion perception) was assessed over time along and their association with both clinical symptoms and the later development of psychosis. Six hundred and seventy-five CHR individuals and 264 HC participants completed four tests of social cognition at baseline. Of those, 160 CHR and 155 HC participants completed assessments at all three time points (baseline, 1 year and 2 years) as part of their participation in the North American Prodrome Longitudinal Study. The CHR group performed poorer on all tests of social cognition across all time points compared to HCs. Social cognition was not associated with attenuated positive symptoms at any time point in the study. CHR individuals who developed a psychotic disorder during the course of the study did not differ in social cognition compared to those who did not develop psychosis. This longitudinal study demonstrated mild to moderate, but persistent ToM and social perception impairments in those at CHR for psychosis compared to HCs.

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1. Introduction

The NIMH Workshop of Social Cognition in Schizophrenia defines social cognition as a function that involves the perception, interpretation and processing of information that underlies social interactions. Because of the emphasis on a direct association with social behavior and a number of real world outcomes, social cognition has become one of the major areas of interest in schizophrenia (Pinkham et al., 2014). This is not accidental or surprising given overwhelming reports

of poor social and role functioning in schizophrenia. The Social Cognition Psychometric Evaluation (SCOPE) study (Pinkham et al., 2014), which was designed to achieve a consensus on the key domains of social cognition in schizophrenia based on the expert advice, identified four major domains of social cognition: 1) theory of mind (ToM) or the ability to attribute beliefs and intentions to oneself and others; 2) emotion perception (both prosodic and facial) or the ability to recognize other people's feelings from either facial expressions or vocal inflections and use them to guide behaviors; 3) social perception and knowledge or the ability to judge and be aware of cues and rules that occur in social situations; and 4) attributional style or bias, which refers to an individual's tendency to attribute the cause of an event to either oneself, others or the environment. Deficits in social cognition are well

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evidenced in schizophrenia, both in the established illness (Penn et al., 2008) and prior to the illness onset (Barbato et al., 2015; Green et al., 2012) suggesting that they are relatively stable (Horan et al., 2012).

Recent progress in risk identification methodology has made it possible to identify individuals who are at clinical high risk of developing psychosis (CHR) based on clinical phenomenology, in particular sub-threshold psychotic symptoms (Addington and Heinssen, 2012). In the past decade, there has been a surge of studies examining social cognition in CHR populations compared to healthy controls (HCs) and patients with psychosis. Although the findings from these studies are mixed, the majority report quantifiable deficits in social cognition in CHR populations relative to healthy controls. Furthermore, the severity of those deficits is often similar to patients with psychotic disorders (Green et al., 2012; Thompson et al., 2011). Two recent meta-analyses of social cognition in CHR, reported deficits in all domains of social cognition (Lee et al., 2015; van Donkersgoed et al., 2015). The largest cumulative deficits have been observed in attributional bias and ToM, with somewhat smaller effects for emotion perception and social perception. The overall magnitude of social cognitive deficits in those at CHR fell between that of schizophrenia patients and their non-affected relatives (Lee et al., 2015). However, despite relatively consistent findings of social cognitive deficits in CHR samples, some reports support (Bora et al., 2008; Healey et al., 2013) and others deny (Lee et al., 2015; van Donkersgoed et al., 2015) whether social cognitive deficits predict conversion to psychosis.

Most studies that have examined social cognition in CHR to date have been based on small samples and have examined only one or two social cognitive domains at a time. The North American Prodrome Longitudinal Study (NAPLS 2) group recently published baseline data on social cognition and its association with symptoms in a large group of CHR participants assessing three different domains: ToM, social perception and facial emotion perception. At study entry, the CHR group showed deficits in all domains of social cognition compared to age and gender matched HCs. These deficits however, were not related to attenuated positive and negative symptom severity (Barbato et al., 2015). The aim of the current paper is to examine: first, the stability of social cognition over time; secondly, the cross-sectional correlations between social cognition and clinical symptoms at each time point; and thirdly to examine whether there are differences in social cognition between those who develop psychosis and those who do not in the NAPLS 2 sample.

2. Methods

2.1. Participants

Participants were recruited as part of the multi-site NIMH funded NAPLS 2 that consisted of 764 CHR individuals (436 males, 328 females) and 280 HCs (141 males, 139 females) recruited across the eight NAPLS 2 sites. The majority, 743 CHR subjects, met the Criteria of Prodromal Syndromes (COPS) (McGlashan et al., 2010), however 21 CHR subjects were considered high risk due to presence of schizotypal features and age less than 18. Participants were excluded if they met criteria for any current or lifetime axis I psychotic disorder, IQ below 70 and past or current history of a clinically significant central nervous system disorder. Healthy controls were excluded if they had a first-degree relative with a current or past psychotic disorder. A more detailed description of recruitment procedures, ascertainment, and inclusion and exclusion criteria is provided elsewhere (Addington et al., 2015).

2.2. Measures

The Structured Interview for Psychosis-risk Syndrome (SIPS) (McGlashan et al., 2010) was used to determine whether an individual met COPS criteria. The Scale of Prodromal Symptoms (SOPS) consisting of 19 items in 4 symptom domains (i.e. positive, negative, general, and disorganized symptoms) was used to rate the severity of CHR symptoms.

Three well-established areas of social cognition were assessed in the current study; ToM, facial emotion perception and social perception, using validated measures (Pinkham et al., 2014). ToM was assessed using the Social Inference subscale of The Awareness of Social Inference Test (McDonald et al., 2003); facial emotion perception was assessed with the Penn Emotion Recognition task and the Penn Emotion Differentiation task (Gur et al., 2002); and social perception was assessed using the abbreviated version of the Relationship Across Domains (Sergi et al., 2009).

The Social Inference subscale of the TASIT includes 16 short video scenes, enriched with contextual cues, where actors are engaged in everyday conversations and use lies and sarcasm. In half of the vignettes the main speaker conveys a message that is contrary to what he or she believes (i.e., a lie), and in the other half the main speaker says something that is contrary to the actual meaning he or she wishes to convey (i.e., sarcasm). After each scene, participants answer questions about what the characters are thinking, doing, feeling and saying. Participants can answer "yes", "no" or "don't know". For each scene, the maximum score is four, yielding a maximum score of 64 as well as sub-scores for Lies and Sarcasm. The TASIT is an audiovisual measure with good psychometric properties and high ecological validity (McDonald et al., 2006) its efficacy in detecting ToM deficits has been proven with CHR individuals (Green et al., 2012).

To assess facial emotion perception, two well-established computerized tasks, the ER40 and the EDF40, were used. In these tasks, pictures representing facial expressions are shown in color. There are an equal number of male and female faces, and four races are represented (Caucasian, African-American, Asian and Hispanic). In the ER40, one face at a time is shown and participants have to choose the emotion that is represented from a list of five possibilities (anger, fear, neutral, happy and sad), shown on the right side of the screen. In the EDF40, two faces are shown and participants are asked to indicate which one shows an emotion (either happiness or sadness) more intensely. For the ER40 task, there is a total score ranging from 0 to 40, and individual sub-scores for happy, sad, angry, fearful and neutral facial expressions. For the EDF40 task, there is a total score ranging from 0 to 40, and two sub-scores for happy and sad facial expressions. Both of these tasks have been previously used with CHR individuals (Kohler et al., 2014).

The RAD is a measure of competence in relationship perception. We used the RAD-45 items, an abbreviated version of the RAD. The RAD-45 contains 15 vignettes each involving two characters whose interpersonal behaviors are consistent with one of the four relational models (Fiske, 2004). According to the relational model theory, people base their relationships on four implicit relationship models that regulate social behavior in several different domains of social life. Relationships conforming to the first model, named Communal Sharing, are based on the idea that the individuals have something in common and are equivalent and undifferentiated. The second model is called Authority Ranking and refers to relationships where there is a hierarchy between the members, which can be classified into "decision makers" and "followers". The third model is called Equality Matching and is based on relationships involving a one-to-one distribution of efforts and resources between members. In the fourth model, called Market Pricing, relationships are based on ratios and rates, and members are focused on proportionality based on their contribution to a certain activity or business. In the RAD, each vignette is followed by three statements that describe interactions between the same two characters in different situations, with each statement representing one of the relational models. Participants are asked to use the information they have learned from the vignette to judge (answering yes/no) whether the behaviors described in each statement are likely to occur. Performance is measured as the total number of correct responses (ranging from 0 to 45) and four sub-scores, one for each relational model named above. The RAD has good psychometric properties and was specifically developed