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Theory of mind and social judgments in people at clinical high risk of psychosis

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ABSTRACT

Background: Social cognitive deficits are consistently reported in psychotic populations. Few studies have longitudinally investigated social cognition in clinical high-risk (CHR) populations.
Aims: Longitudinally examine theory of mind (ToM) and social judgments in a CHR sample to investigate the stability of performance over time and potential ability to predict conversion to psychosis.
Method: 147 CHR individuals and 85 help seeking controls (HSC) were assessed for up to 2 years; 28 participants developed psychosis across both groups. Generalized linear mixed models for repeated measures were used to examine change over time for ratings on the three social cognitive indices of ToM, trustworthiness, and approachability. Hierarchical regression was used to test whether social cognitive variables explain more variance in conversion than IQ.
Results: CHR individuals showed a positive bias in approachability judgments over time compared to HSC. Baseline ToM performance significantly ($p < .05$) predicted later conversion beyond IQ scores. These results were attenuated when controlling for baseline symptom level.
Conclusions: Although ToM deficits might predate conversion to psychosis, one must consider initial symptoms as well. Social judgments were not associated with conversion to schizophrenia.

1. Introduction

Similar to preventative work targeting medical illness, many research groups have focused on improving models of risk prediction in schizophrenia (Cannon et al., 2008). A central goal of this work is to enhance the understanding of factors related to conversion to psychosis and illness progression. Preliminary evidence suggests that social cognition (SC) may be a viable target, as deficits in SC are both present during the active illness phase and in populations at clinical high risk (CHR) for developing psychosis (Green et al., 2008; Thompson et al., 2011). Specifically, there is some support for deficits in emotion recognition and theory of mind (ToM) prior to illness onset. Thus, the assessment of SC deficits in individuals at clinical high risk (CHR) of developing schizophrenia warrants further exploration, as it may lead to the identification of a putative risk marker. The present study examines the SC domains of ToM and social judgments in a CHR population.

Individuals with first episode and chronic schizophrenia show consistent impairments in theory of mind (ToM) (Sprong et al., 2007). ToM typically refers to the ability to infer others' mental states (Green et al., 2008). In CHR individuals, there is mixed support for deficits in ToM. These studies are largely cross-sectional in design and administer a heterogeneous group of ToM tasks. Couture et al. (2008) found no significant differences in higher order ToM performance (Eyes Task) between CHR and healthy control (HC) groups. Stanford et al. (2011) also found no significant differences between CHR and HC groups in Eyes Task performance, nor with other first- and second-order ToM tasks (False Belief, Strange Story Tasks). Effect sizes (Cohen's d) computed from mean differences between HC and CHR groups were small in both studies ($d = .06-.35$) (Cohen, 1988). Conversely, Chung et al. (2008) utilized higher order, verbal tasks of ToM (False Belief and Strange Story Task) and found significant differences between CHR individuals and HCs matched on age and IQ. Recent studies provide further evidence of significant deficits in higher order ToM performance in CHR groups, although they were unable to draw conclusions about deficits' association with later conversion (Green et al., 2012; Thompson et al., 2012; Hur et al., 2013).

There is one prior study in CHR individuals that assessed ToM longitudinally to predict progression to psychosis. Kim at al. (2011) examined performance in four lower and higher order ToM tasks in 49

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ultra-high risk (UHR) individuals over time (mean = 2.8 years). They found significant differences between converters (n = 13) and non-converters (n = 36) at baseline in both higher order verbal (False Belief task; $d = .74$) and lower order non-verbal (Cartoon Task; $d = .59$) tasks. Further, there was not a significant relationship between ToM and symptoms, consistent with previous work (Couture et al., 2008; Stanford et al., 2011). Findings support the predictive value of ToM deficits in later conversion to psychosis. Taken together, this suggests that due to inconsistent findings and cross sectional design, further longitudinal investigation of ToM deficits in clinical high-risk groups is warranted.

There is a less extensive literature investigating social judgments in psychotic spectrum illnesses. Social judgments include trustworthiness and approachability ratings, which require usage of nuanced, subtle information conveyed in facial appearances. Social judgments require integration of various sources of information, such as facial expression and previous experiences with similar looking individuals (Couture et al., 2008). Such evaluations are antecedents in decision-making processes that directly influence social behaviors. In chronic schizophrenia, findings are mixed regarding social judgments assessed with the trustworthiness task (Adolphs, 1998), although individuals with non-paranoid schizophrenia tend to rate unfamiliar faces as more trustworthy and with greater variability than controls (Baas et al., 2008a, 2008b; Pinkham et al., 2008; Couture et al., 2010; Haut and MacDonald, 2010). Comparatively little work has focused on social judgments in CHR populations. Baas et al. (2008b) found that individuals at genetic risk of developing psychosis (first degree family members) rated faces significantly trustworthier than healthy controls. Similarly, Couture et al. (2008) found that CHR individuals judged a subset of untrustworthy faces as significantly trustworthier than healthy controls. Positive biases in social judgments are consistent with a body of established social cognitive deficits in schizophrenia, whereby patients have difficulty recognizing and applying appropriate social information (Baas et al., 2008b).

The aim of the present study is to longitudinally investigate ToM and social judgment performance in a group of CHR individuals compared to a group of help seeking control (HSC) individuals. Here, we assess whether ToM and social judgment performance (a) differentially changes over time as a function of risk status and (b) predicts conversion to psychosis at baseline.

2. Methods

2.1. Sample

The sample consisted of 147 participants (85 males, 62 females) at CHR of developing psychosis with a mean age of 19.8 (SD = 4.7) and 85 help-seeking control (HSC) participants (44 males, 41 females) with a mean age of 19.4 (SD = 4.1) years. All data was collected as a part of the PREDICT study conducted at the Universities of North Carolina (59 CHR, 21 HS), Toronto (60 CHR, 40 HS), and Yale (28 CHR, 24 HS). The methods are described in detail in Addington et al. (2012). All CHR participants met Criteria of Prodromal Syndromes (COPS) derived from the Structured Interview for Prodromal Syndromes (SIPS: McGlashan et al., 2010). A majority of CHR participants (N = 145) met criteria for attenuated positive syndrome (APSS). Only three participants met criteria for genetic risk and deterioration (GRD), which requires either an affected first degree relative or the subject having schizotypal personality disorder (SPD) and >30% drop in functioning on the General Assessment of Functioning (GAF) scale in the past 12 months.

The help-seeking control group (HSC) was comprised of individuals who had (1) responded to CHR recruitment and (2) presented with prodromal symptoms at phone screen but upon administration of the full interview did not meet prodromal criteria. The HSC group contains the following subgroups: (1) family high risk but no deterioration in GAF (n = 16) (2) long-standing attenuated symptoms present for >1 year (n = 39) (3) current prodromal symptoms but symptoms were clearly due to another disorder (n = 2) (4) had only negative symptoms (n = 4) and (5) symptoms that did not meet severity or frequency criterion (n = 24). HSC individuals were included as a clinically relevant control group that provides a more stringent test of conversion, as CHR and HSC individuals are more symptomatically similar to one another than to healthy controls.

The Structured Clinical Interview for DSM-IV (SCID-I: First et al., 1995) was administered to determine the presence of any axis I disorders. Exclusion criterion was: presence of an axis I psychotic disorder, IQ less than 70, or the presence of a clinically significant CNS disorder that may be related to CHR symptoms. Individuals were also excluded for history of antipsychotic treatment, as the PREDICT study aimed to examine predictors of conversion to psychosis without the confound of antipsychotics. After conducting comprehensive clinical assessments to determine inclusion, participants completed the ToM and social judgment tasks. Additionally, the number of subjects at follow-up is inconsistent, thus missing subjects are accounted for by (1) dropping out of the study, (2) missing the assessment, and (3) conversion to psychosis (Table 1).

2.2. Measures

2.2.1. Clinical measures

Prodromal syndrome and conversion criteria were assessed using the SIPS (McGlashan et al., 2010). Conversion meant that at least one of the five attenuated positive symptoms reached a psychotic level of intensity (rated 6) for a frequency of ≥ 1 h/day for 4 days/week during the past month or that symptoms seriously impacting functioning (e.g. severely disorganized or dangerous to self or others) (McGlashan et al., 2010). Symptoms were assessed with the Scale of Prodromal Symptoms (SOPS), which is comprised of 19 items in 4 symptom domains: positive, negative, general, and disorganized.

2.2.2. Theory of mind task

Theory of mind was assessed with the "Reading the Mind in the Eyes" task (Eyes Task: Baron-Cohen et al., 2001), a multiple choice task requiring the participant to infer mental/emotional states from 37 cropped photos of pairs of eyes. Participants are instructed to select one of four words that best describe what the person is thinking or feeling based on their eyes. They are provided with standardized definitions of word choices at their request. The Eyes Task was selected for its frequent usage in schizophrenia spectrum disorders (Pinkham et al., in press).

Table 1
Number of subjects at follow-up by group.

	Assessment (years)			
	0.5	1	1.5	2
Completed				
CHR	76	49	34	24
HSC	48	46	31	24
CHR and HSC	124	95	65	48
Study ended (drop outs)				
CHR	46	71	85	94
HSC	23	33	46	57
CHR and HSC	69	104	131	151
Missed assessment				
CHR	8	7	7	4
HSC	10	3	4	1
CHR and HSC	18	10	11	5
Converted				
CHR	15	20	22	25
HSC	3	3	3	3
CHR and HSC	18	23	25	28