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Social cognitive performance as a marker of positive psychotic symptoms in young people seeking help for mental health problems

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ABSTRACT

Previous research has suggested that psychotic symptoms are associated with impairments in social cognition. However, there is limited research evaluating this association in the context of younger patients with a broad range of mental health problems. In the present study, we evaluated social cognitive performance in 115 treatment-seeking participants who presented to a youth mental health service with affective or psychotic disturbances. Participants completed symptom severity measures, a social cognition task (the Reading the Mind in the Eyes Test (RMET)), and a standardised battery of neuropsychological tests. Analyses based on diagnostic groups showed that patients with psychotic illnesses ($n = 23$) showed impaired performance on the RMET compared to patients with primarily bipolar ($n = 40$) and depressive illnesses ($n = 52$). Performance on the RMET was negatively correlated with positive and negative psychotic symptoms, but not affective and anxiety symptoms. Performance on the RMET also was the strongest concurrent predictor of positive psychotic symptoms in a regression model that also included predicted intelligence, demographic variables, and neurocognition. RMET performance did not, however, predict negative symptoms above tests of sustained attention and verbal learning, nor was performance associated with any other symptoms of mental illness. Social cognitive impairments may provide a valuable marker for the presence of positive psychotic symptoms in young people with mental illness. Additionally, these impairments may have a role in the aetiology and maintenance of psychotic symptoms. Research is now needed to establish the nature of the relationship between social cognition and psychotic symptoms across different facets of social cognition. Research is also needed to investigate whether targeted social cognition treatments reduce risk for the development of positive psychotic symptoms.

1. Introduction

A growing body of research suggests that social cognition is a specialised neurocognitive domain that facilitates effective social communication and relationships (see reviews in Green et al., 2008; Green and Horan, 2010). These mental operations include the capacity to hold eye gaze and attend to relevant features of faces, recognise and interpret emotions from facial expressions (Kee et al., 2006), identify and attribute signals of social threat (Premkumar et al., 2008), and to accurately infer the mental states of others (i.e. Theory of Mind; Kettle et al., 2008).

Individuals with psychotic illnesses perform poorly on tests of social cognition (Langdon et al., 2002; Penn et al., 2008). Of note, social cognition performance is impaired in early psychosis (Addington et al., 2006; Bertrand et al., 2007; Thompson et al., 2012) and performance on such measures is associated with the severity of positive (Mancuso et al., 2011) and negative (Edwards et al., 2001; Sergi et al., 2007) symptoms. Social cognitive performance may also predict the expression of positive psychotic symptoms above other measures of general cognition, such as intelligence (IQ) (Pousa et al., 2008). Several studies have, however, argued that the relationship between social cognition and negative symptoms may be accounted for by other cognitive factors (Pousa et al., 2008; Piskulic and Addington, 2011). For example, Pousa et al. (2008) found that differences in Theory of Mind ability across levels of negative, but not positive, symptom severity were related to IQ and illness severity.

Findings have led some to suggest that social cognitive impairments may represent a core feature of psychotic illnesses that contribute to the onset and maintenance of symptoms (Couture et al., 2006; Kee et al., 2006; Thompson et al., 2012). However, the extant literature is currently limited by the use of healthy controls, as opposed to other mental illness comparison groups, and a failure to control for other moderating neuropsychological factors (Kelleher et al., 2012). As a range of cognitive impairments are observed in early psychosis (Agnew-Blais and Seidman, 2012), and both positive and negative symptoms are associated with

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such impairments (Woodward et al., 2009), the degree to which social cognition performance may be able to additionally predict psychotic symptoms has yet to be established. It also remains unclear whether social cognition is uniquely associated with the development of psychotic symptoms or whether these impairments are more generally associated with the onset of more severe and complex mental health symptoms in young populations. There is also a pressing need to identify early markers that can be used to identify those that transition into full threshold psychotic syndromes (Hickie et al., 2012).

The aim of this study was to evaluate the relationship between social cognitive performance, as assessed by the Reading the Mind in the Eyes Test (RMET; Baron-Cohen et al., 2001), and symptom severity in young people with affective and psychotic symptoms. We specifically chose the RMET because the test is quickly administered, sensitive to change in both healthy and clinical samples and, unlike many other tests of social cognition, does not exhibit likely ceiling effects. Additional neurocognition tests included were those we have previously shown sensitivity within young mental health cohorts (Hermens et al., 2011; Lee et al., 2013). We predicted that those diagnosed with a primary psychotic illness would show reduced social cognition performance in comparison to young people with primary depressive and bipolar illnesses. We also hypothesised that social cognitive performance would be associated with psychotic symptoms, but not depressive or anxiety symptoms. Finally, we predicted that variability in social cognitive performance would provide a useful predictive marker, beyond neurocognition, for concurrent positive and negative psychotic symptoms.

2. Materials and methods

2.1. Participants

Participants were recruited from *headspace*, Central Sydney, NSW, a specialised tertiary community referral service developed for the assessment and early intervention of mental health problems in young people (Scott et al., 2009). Participants were selected based on their willingness to participate in comprehensive and longitudinal assessments (Scott et al., 2012). A total of 115 patients were consecutively recruited for the study (between 15 and 30 years old). This cohort was then categorised into three primary diagnostic groups based on primary presenting symptoms: depression (Major Depressive Disorder or Dysthymia; $n = 52$), bipolar (Bipolar Affective Disorder; $n = 40$), or psychosis (Schizophrenia, First Episode of Psychosis or Schizoaffective Disorder; $n = 23$). Nine patients were excluded as they presented with other primary mental disorders (e.g., developmental disorders, substance dependence). Fourteen (12.2%) of the included participants reported comorbid substance misuse disorders. All patients were receiving clinician-based case management at the time of assessment. Exclusion criteria included medical instability (as determined by a psychiatrist), history of neurological disease (e.g. tumour, head injury, epilepsy), medical illness known to impact cognitive and brain function (e.g., sleep apnoea), electroconvulsive therapy in the last 3 months, intellectual disability (a predicted IQ score <70), or insufficient English language skills. The study was approved by the University of Sydney Human Research Ethics Committee. All participants gave written informed consent; for those under the age of 16 years, both the participant and their legal guardian gave written informed consent.

2.2. Procedures

2.2.1. Assessment

Participants were given all forms and questionnaires to complete in the waiting room and then completed the structured clinical interview and neuropsychological assessment on the same day.

2.2.1.1. Clinical assessment. An independent psychiatrist or trained research psychologist conducted a structured clinical interview to confirm the DSM-IV-TR-based (American Psychiatric Association, 2000) diagnoses made by the referring clinician and the nature and history of any mental health problems. Diagnoses were subsequently confirmed through case-note review. This assessment is used consistently across all of our published research in this population and is described in more detail elsewhere (Scott et al., 2009; Hamilton et al., 2011; Lee et al., 2013). As a proxy measure for duration of illness, the age that each patient was first engaged in a mental health service was recorded. In addition to the 17-item Hamilton Depression Rating Scale (HAM-D; Hamilton, 1967), the interview included the 24-item Brief Psychiatric Rating Scale (BPRS; Overall and Gorham, 1962; Lukoff et al., 1986) to quantify positive, negative, mania, depression and disorientation psychiatric symptoms over the past week. Patients were also asked to complete the 21-item Depression Anxiety Stress Scales (DASS; Lovibond and Lovibond, 1995; Antony et al., 1998) to provide a self-report measure of depression, anxiety and stress symptoms during the past week of presentation.

2.2.1.2. Neuropsychological assessment. Predicted IQ was assessed using either the Wechsler Test of Adult Reading (WTAR; Wechsler, 2001) for participants aged 16–30 years, or the Wide Range Achievement Test 4 (WRAT-4; Wilkinson and Robertson, 2006) for participants below 16 years old. The Trail-Making Test — Part A (TMT A) and Part B (TMT B) (Partington et al., 2006) were administered to assess psychomotor speed and mental flexibility, respectively. The Rapid Visual Processing (RVP) task from the Cambridge Neuropsychological Test Automated Battery (CANTAB; Sahakian and Owen, 1992) was used to assess sustained visual attention. The RVP assesses sensitivity to targets (RVP A) and distractors (RVP B). The Rey Auditory Verbal Learning Test (RAVLT; Schmidt, 1996) was used to assess verbal learning and memory. The outcome measure chosen was total number of words recalled across the first five trials (RAVLT Sum 1–5) to assess verbal learning. Finally, the Spatial Span Test (SSP) from the CANTAB (Sahakian and Owen, 1992) was used to assess working memory capacity. The outcome measure of interest was spatial span length (the longest forward sequence recalled successfully).

2.2.1.3. Social cognitive assessment. The RMET (Baron-Cohen et al., 2001) assessed ability to infer mental states from the eyes of others. It consists of 36 images displaying the eye region of human faces depicting various expressions. Participants were asked to pick which of the four words best describe what the person in the photo is thinking or feeling. The RMET yields a total score of correct answers, with past research also splitting items into easy and hard categories (Domes et al., 2007; Guastella et al., 2010). We calculated the percentage correct for the overall total score, as well as easy and hard items. The RMET has been widely used to demonstrate social cognitive deficits in both adult patient populations (Baron-Cohen et al., 2001; Craig et al., 2004; Kettle et al., 2008) and in patients as young as 12 years old (Guastella et al., 2010).

2.3. Data analysis

Statistical analyses were performed using SPSS for Windows 20.0. Group differences in demographic, clinical, and neuropsychological variables were assessed with two-tailed independent t-tests, or chi-square tests where relevant. If homogeneity of variance was violated (according to Levene's test) the corrected degrees of freedom and p-values were reported using Welch's procedure. To control for the effects of age, neuropsychological variables were converted to 'demographically corrected' standardised scores (i.e. z-scores) using established norms (Strauss et al., 2006). Prior to analyses, outliers beyond ± 3.0 z-scores for each neuropsychological variable were curtailed to values of $+3.0$ or -3.0 (depending on the direction) so that between-group tests were not influenced by individuals with extreme scores (i.e., skewed distributions).

Table 1
Demographic measures by primary diagnosis.

Primary diagnosis	Depression[a]	Bipolar[b]	Psychosis[c]	Total[d]
Age *M* (*SD*)	20.23 (3.54)	21.66 (3.47)	22.80 (3.65)	21.24 (3.65)
% Female (*n*)	67 (35)	73 (29)	17 (4)	59 (68)
IQ *M* (*SD*)	105.10 (8.23)	104.87 (6.10)	102.09 (7.59)	104.42 (7.45)

[a] $n = 52$.
[b] $n = 40$.
[c] $n = 23$.
[d] $n = 115$.

Table 2
Medication status by primary diagnosis.

Primary diagnosis	Depression[a]	Bipolar[b]	Psychosis[c]	Total[d]
% (*n*) any AP	25 (13)	60 (24)	91 (20)	50 (57)
% (*n*) any AD	67 (35)	60 (24)	14 (3)	54 (62)
% (*n*) any MS	4 (2)	40 (16)	5 (1)	17 (19)

Note. % on any AP = percentage of participants in that category on any antipsychotic medication; % on any AD = percentage of participants in that category on any antidepressant medication; % on any MS = percentage of participants in that category on any mood stabiliser medication.
[a] $n = 52$.
[b] $n = 40$.
[c] $n = 22$.
[d] $n = 114$.

3. Results

3.1. Descriptive statistics

Table 1 provides the baseline characteristics of the sample. A chi-square test run using a Fisher's exact test on gender and diagnosis group was significant ($\chi^2 = 20.80, p < 0.001$). Follow-up tests indicated a greater proportion of males in the psychosis sub-group (83%) in comparison to the bipolar (23%) and depression (33%) subgroups. One-way ANOVA tests indicated that there was a significant difference in age across diagnostic groups, $F\ (2, 112) = 4.65$, $p = .01$. Post-hoc pairwise comparisons indicated no significant differences in age between psychotic and bipolar patients. However, those characterised as depressed were significantly younger than psychotic patients ($p = 0.01$). A one-way ANOVA indicated no significant differences in predicted IQ score across diagnostic subgroups (see Table 1), $F\ (2, 112) = 1.43$, $p = 0.24$. Table 2 presents the medication use (antipsychotics, antidepressants, and mood stabilisers) across diagnostic subgroups.

Table 3 presents the descriptive statistics for BPRS, HAM-D and DASS-21 subscales across the diagnostic subgroups. One-way ANOVA tests indicated significant between group differences for HAM-D scores, $F\ (2, 112) = 3.65$, $p = 0.03$, as well as the DASS-Stress, $F\ (2, 112) = 3.676$, $p = 0.03$, and Depression subscales, $F\ (2, 112) = 7.52$, $p = 0.001$. Post-hoc pairwise analyses indicated that depressed patients had significantly greater DASS-Depression and HAM-D scores than both psychotic and bipolar patients (all p's < 0.05). Psychotic patients had significantly higher BPRS positive symptom scores and lower DASS-Stress scores than depressed patients, as well as significantly greater BPRS negative symptom scores than both depressed and bipolar patients.

3.2. Social cognitive performance as a function of primary diagnostic cluster

To determine whether performance on the RMET differed as a function of primary diagnostic group (Fig. 1), a one-way ANOVA was run with primary diagnostic group as the between subjects factor and percentage correct on the RMET as the dependent variable. Results revealed a significant main effect of group, $F\ (2, 112) = 5.07$, $p = 0.008$.[1] Post-hoc pairwise tests confirmed that participants presenting with a psychotic disorder exhibited poorer performance on the RMET, in comparison to bipolar and depressed patients. Similar significant main effects of group were found on both easy items, $F\ (2, 112) = 4.21$, $p = 0.02$; and hard items of the RMET, $F\ (2, 112) = 3.94$, $p = 0.02$.

3.3. Relationship between symptom severity and social cognition

Symptom severity characteristics were correlated with performance on the RMET. Results are presented in Table 4. Positive and negative symptoms on the BPRS were significantly associated with RMET performance (both $p < 0.05$). In contrast, no significant relationship was found between RMET performance and disorientation, mania, depression or anxiety symptom sub-scales. Positive symptoms were correlated with the RVP A ($r = -0.19$, $p = 0.04$) whilst negative symptoms were associated with the RAVLT Sum ($r = -0.28$, $p = 0.002$) and RVP A ($r = -0.22$, $p = 0.02$). Correlations were then run between tests of neurocognition and the RMET. Of the neuropsychological tests, all except the RVP B and SSP were significantly correlated with RMET performance, including predicted IQ ($r = 0.42$, $p < 0.001$), RVP A ($r = 0.25$, $p = 0.007$), RAVLT Sum ($r = 0.48$, $p < 0.001$), TMT B ($r = -0.23$, $p = 0.016$), and TMT A ($r = -0.26$, $p = 0.05$).

3.4. Prediction of symptom severity using social cognitive performance

Based on the above relationships, two forced-entry hierarchical linear regressions were run to assess the capacity of social cognition performance to predict the severity of positive and negative symptoms (see Table 5). In both models, age and gender were entered as control variables in the first step, and the neuropsychological test variables of IQ, TMT A, TMT B, RVP A, and the RAVLT Sum 1–5 were entered in step 2. RMET score was added in the third step. For positive symptoms, control variables (both demographic variables and neuropsychological tests) together accounted for 9.7% of variance, $F\ (7, 107) = 1.65$, $p > 0.05$. When the RMET was added in the third step it resulted in a significant increase ($p = 0.008$) in the proportion of variance in positive symptoms explained by the model (see Table 5), accounting for a further 5.9% of the variance. For negative symptoms, the control variables alone accounted for a significant 23.9% of the variance, $F\ (7, 107) = 4.79$, $p < 0.001$. The addition of the RMET score in the third step did not account for any further variance, although the overall model including demographics, neuropsychological test performance, and RMET remained significant (see Table 5).[2] Identical regression analyses were conducted with each of the other symptom severity subscales (DASS, HAM-D, and BPRS) as criterion variables, to confirm that the relationship between symptom severity and social cognitive performance was unique to positive symptoms of psychosis. The addition of RMET did not significantly predict outcome on any other symptom domain ($p > 0.05$).

4. Discussion

Results from this study demonstrated that patients with a primary psychotic illness performed more poorly on the RMET, in comparison to groups with primary depressive and bipolar illnesses. Importantly,

[1] We repeated this analysis after excluding the small number of individuals who experienced psychotic symptoms in the context of a primary depressive ($n = 2$) or bipolar ($n = 7$) illness, obtaining the same significant difference in RMET scores across groups, $F\ (2, 103) = 5.13$, $p = 0.008$, with the same outcome for the post-hoc tests.

[2] In order to account for possible effects of antipsychotic medication on both symptoms and social cognition test performance, we repeated these analyses with use of antipsychotic medication (coded as a categorical variable) included alongside gender in the first step of the regression predicting positive and negative symptoms. This did not significantly alter interpretation of the results. That is, RMET social cognition test performance still accounted for a significant proportion of variance in positive symptoms, but not negative symptoms, after controlling for the effects of medication, gender, and neuropsychological test performance.

Table 3
Symptom severity measures (means and standard deviations) by primary diagnosis.

Symptom severity measure	Primary diagnosis			
	Depression[a]	Bipolar[b]	Psychosis[c]	Total[d]
HAM-D	14.90[e]	11.54[f]	10.73[f]	12.90
	(8.11)	(6.92)	(5.83)	(7.47)
DASS-A	15.38[e]	12.73[e]	11.28[e]	13.64
	(9.45)	(9.01)	(10.08)	(9.49)
DASS-S	22.35[e]	19.65[e, f]	15.88[f]	20.11
	(8.35)	(10.57)	(10.57)	(9.85)
DASS-D	23.19[e]	16.76[f]	13.39[f]	18.90
	(10.41)	(12.28)	(10.15)	(11.67)
BPRS-Dep	15.36[e]	13.52[e]	12.99[e]	14.25
	(4.84)	(5.04)	(4.57)	(4.91)
BPRS-P	10.24[e]	11.12[e, f]	12.27[f]	10.96
	(2.30)	(4.30)	(4.57)	(3.65)
BPRS-N	7.66[e]	7.34[e]	9.36[f]	7.89
	(3.07)	(2.96)	(4.09)	(3.32)
BPRS-M	9.38[e]	9.79[e]	9.79[e]	9.60
	(3.01)	(3.98)	(2.56)	(3.28)
BPRS-Dis	2.20[e]	2.03[e]	2.27[e]	2.16
	(0.68)	(0.16)	(0.91)	(0.62)

Note. Means with the same superscript do not differ significantly at the 0.05 level (adjusted *p*-values with Bonferroni correction). DASS-A (DASS Anxiety); DASS-S (DASS Stress); DASS-D (DASS Depression); BPRS-Dep (BPRS Depression); BPRS-P (BPRS Positive); BPRS-N (BPRS Negative); BPRS-M (BPRS Mania); BPRS-Dis (BPRS Disorientation).
[a] $n = 52$.
[b] $n = 40$.
[c] $n = 23$.
[d] $n = 115$.

social cognitive performance was associated with, and concurrently predictive of, psychotic, but not other affective, symptoms. That is, performance on the RMET was both negatively correlated with positive psychotic symptoms and the strongest concurrent predictor of positive psychotic symptoms when included with several other measures of neurocognition. For negative symptoms, performance on the RMET was also negatively correlated with negative symptoms, but this relationship was better accounted for by performance on tests of sustained attention and verbal learning. This suggests that the unique contribution that the RMET performance provides to symptom presentation seems specific to the positive symptoms of psychosis (Addington et al., 2006; Pousa et al., 2008). Findings here are the first to explore the relationship between social cognitive performance and psychotic symptoms across a large cohort of young people presenting for general mental health treatment. Our findings suggest that social cognition performance may provide a particularly useful and separate cognitive marker associated with positive psychotic illness severity (Thompson et al., 2011), which is above traditional symptom severity assessments. Although findings presented here cannot address the causal nature of this relationship, the results provide indirect support for the hypothesis

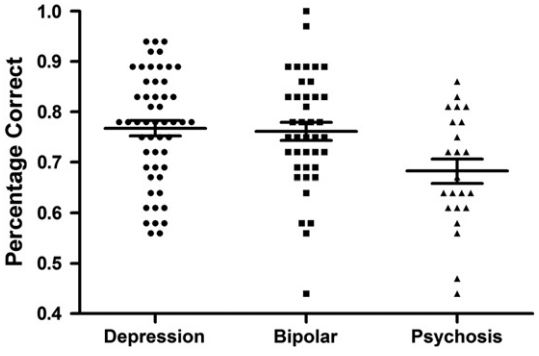

Fig. 1. RMET performance by diagnostic group.

Table 4
Pearson correlations between symptom severity measures and the RMET.

	RMET
HAM-D	−0.05
DASS Anxiety	−0.03
DASS Depression	−0.04
DASS Stress	−0.02
BPRS Depression	0.05
BPRS Positive symptoms	−0.28**
BPRS Negative symptoms	−0.21*
BPRS Mania	−0.10
BPRS Disorientation	−0.11

Note. $n = 115$. All correlations are two-tailed.
* $p < 0.05$.
** $p < 0.01$.

that social cognitive deficits may have an important relationship with positive psychotic symptoms. One possibility is that social cognitive deficits, such as impaired Theory of Mind, may interrupt one's ability to quickly process and accurately assess social information (Couture et al., 2006; Kee et al., 2006; Fett et al., 2013), which, in turn, could contribute to the development and exacerbation of delusional and paranoid thinking. Our study also builds on previous research highlighting the important relationship of other aspects of cognitive impairment, such as processing speed (González-Ortega et al., 2012; Kelleher et al., 2012) with the negative symptoms of psychosis. The present study suggests that these more traditional tests of neurocognitive function underlie the relationship between RMET performance and negative symptoms. These other tests seem to provide more important markers for the presence of such symptoms than social cognitive performance alone.

We note that our results differ from those of Bertrand et al. (2007), who did not find a relationship between state-based psychotic symptoms and social cognition performance in early psychosis. This may be due to differences in the social cognition tests used, and the smaller

Table 5
Degree to which demographic variables, traditional neuropsychological variables, and social cognition performance predicts positive and negative symptoms.

	Predictor	Positive symptoms		Negative symptoms	
		Predictor B	Model ΔR^2	Predictor B	Model ΔR^2
Model 1	Gender	−0.61		−1.80**	
	Age	−0.17		0.09	
			0.03		0.09**
		Model F (2, 112) = 1.80, $p = .171$		Model F (2, 112) = 5.36, $p = .006$	
Model 2	Gender	−0.49		−1.79**	
	Age	−0.15		0.14	
	IQ	0.03		0.04	
	TMT A	−0.35		−0.07	
	RVP A	−0.62		−0.99**	
	RAVLT	−0.78		−0.91*	
	TMT B	−0.25		0.69	
			0.07		0.15**
		Model F (7, 107) = 1.65, $p = .130$		Model F (7, 107) = 4.79, $p < .001$	
Model 3	Gender	0.13		−1.76*	
	Age	−0.16		0.14	
	IQ	0.06		0.05	
	TMT A	−0.51		−0.07	
	RVP A	−0.40		−0.99**	
	RAVLT	−0.47		−0.89*	
	TMT B	−0.16		0.69	
	RMET	−9.64**		−0.38	
			0.06**		<0.001
		Model F (8, 106) = 2.45, $p = .018$		Model F (8, 106) = 4.16, $p < .001$	

* $p < 0.05$.
** $p < 0.01$.

sample of patients assessed in that study who presented with psychotic illnesses. These differences make it difficult to directly compare these results with the present findings. Other research supports the view that social cognitive impairments may provide a novel cognitive marker for those in the very early stages of psychotic illness that also predicts progression towards more severe illness (Kim et al., 2011). Future studies using prospective longitudinal designs are now required to explore this possibility. A number of targeted social cognition treatment programs have been recently developed for those with psychotic illnesses (Frommann et al., 2003; Roncone et al., 2004; Penn et al., 2005; Wolwer et al., 2005; Choi and Kwon, 2006; Combs et al., 2007; Penn et al., 2007; Horan et al., 2008). Medications have also emerged offering potential to improve social cognitive performance (Domes et al., 2007; Pedersen et al., 2011; Guastella and MacLeod, 2012). Through the manipulation of social cognitive ability, such treatments provide the potential to determine the functional impact of social cognition on psychotic illness states.

The present study involved a cohort of consecutively recruited patients presenting for treatment to a youth mental health service for a range of mental health issues. The advantage of such research is that it provides data from naturalistic populations, thus increasing the generalisability of our findings. We did not, however, specifically seek to recruit matched groups of diagnostic clusters and stratify according to demographic variables. Not surprisingly, age and gender were not stratified according to diagnosis allocation. More males were assessed in the psychosis group, in comparison to the bipolar and depression groups, and these individuals were slightly older. Whilst these demographic variables were statistically controlled for in analyses, further research is required to understand the potential of gender and associated hormonal differences that may impact on the association between social cognition and psychotic symptoms. Future studies should also include an assessment of socio-economic status.

Due to time restrictions, we chose one measure to assess social cognition. This is a widely used Theory of Mind assessment and is ideal to use in cohorts without severe cognitive decline, as ceiling performance is uncommon. We acknowledge, however, that the RMET does not assess many of the other facets of social cognition, such as gaze processing, prosody, and sarcasm identification. These other facets may also be important predictors of psychotic illness and have different relationships with positive and negative symptoms to that of the RMET. Whilst we did include a range of neurocognition tests, it is possible that that the association between RMET performance and psychotic symptoms may be mediated by a third variable that we did not assess (for example, verbal ability). Further research is therefore required to explore which other cognitive mechanisms might underlie RMET performance. Lastly, whilst it was not the goal of this study to examine social functioning, future research should also assess inter-relationships between symptoms, social cognition, and functional outcome in this population of young mental health patients. This is of particular interest as social functioning is a key goal of targeted social cognition treatment efforts.

In summary, this study provides the first evidence of an association between social cognitive performance and positive psychotic symptoms among a young mental health treatment-seeking community sample. It further highlights the importance of social cognition in the diagnosis and treatment of psychosis in young people at earlier stages of illness severity.

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Contributors

AG, DH, AVZ, SN and RL designed the study, AG and AVZ wrote the first draft of the study, and all authors (AG, DH, AVZ, SN, RL, CCS, ES, IBH) wrote and read the subsequent drafts of the study and approved the final submitted manuscript.

Conflict of interests

All authors report no conflict of interests.

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