



## 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.

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### 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  $\pm 3.0$  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).

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