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## Psychometrics of social cognitive measures for psychosis treatment research

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### ABSTRACT

Social cognition represents an important treatment target, closely linked to everyday social function. While a number of social cognitive interventions have recently been developed, measures used to evaluate these treatments are only beginning to receive psychometric scrutiny.

Study goals were to replicate recently-published psychometrics for several social cognitive measures, and to provide information for additional social cognitive measures not included in recent reports.

Forty-eight outpatients with psychotic-spectrum disorders completed measures of emotion perception, theory of mind, and attributional bias on two occasions, one month apart. Measures were tested for distributional characteristics, test-retest reliability, utility as a repeated measure, and relationship to symptoms and functioning. For a subgroup of participants, information about sensitivity to social cognitive treatment was also available.

We replicated aspects of prior work, including largely favorable psychometric characteristics for the Bell-Lysaker Emotion Recognition Task, and promising but weaker characteristics for The Awareness of Social Inferences Test subscales and Reading the Mind in the Eyes Task. The Hinting Task had adequate test-retest statistics but a more pronounced ceiling effect. Ambiguous Intentions and Hostility Questionnaire data showed evidence of validity but were limited by inconsistency over time. Our results strongly support the Davos Assessment of Cognitive Biases Scale for future evaluation as a social cognitive treatment outcome measure. Its scores were adequately distributed, consistent over time, related to symptoms and functioning, and sensitive to treatment effects. Other relatively novel assessments of attributional bias and theory of mind showed some promise, although more work is needed.

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### 1. Introduction

Social cognition has been defined as "the mental operations that underlie social interactions, including perceiving, interpreting, and generating responses to the intentions, dispositions, and behaviors of others" (Green et al., 2008). Significant difficulties in multiple aspects of social cognition precede the onset of psychotic symptoms, are stable over different phases of illness, and uniquely forecast functional outcome in schizophrenia (Brekke et al., 2005; Couture et al., 2006; Green et al., 2012; Musso et al., 2013; Piskulic et al., 2016; Savla et al., 2012), and hence represent an important treatment target. Social cognitive interventions have proliferated in recent years, and while there is some evidence for their efficacy (Fiszdon and Reddy, 2012; Kurtz and Richardson, 2012), little is known about the psychometric properties of many measures currently used to evaluate the effects of social

cognitive interventions, hampering the interpretations that can be made about these treatments as well as efforts at additional treatment development.

The Social Cognition Psychometric Evaluation (SCOPE) study sought to address the lack of well-validated measures of social cognition by evaluating the psychometric properties of several widely used social cognitive measures nominated by a RAND expert panel. Outpatients with schizophrenia ( $n = 170$ ) and healthy controls ( $n = 104$ ) completed a social cognition battery at baseline and a 2–4 week retest period. Tasks were evaluated on test-retest reliability, utility as a repeated measure, and relationship to functional outcome, in addition to other psychometric characteristics. Of the eight tasks assessed, only two, the Bell-Lysaker Emotion Recognition Task (BLERT; Bryson et al., 1997), and the Hinting task (Corcoran et al., 1995) showed strong psychometric properties across most evaluation criteria and were recommended for use in clinical trials. Tasks with somewhat weaker properties that were deemed to deserve further study included the Reading the Mind in the Eyes Task (Eyes; Baron-Cohen et al., 2001), and The Awareness of Social Inference Test (TASIT; McDonald et al., 2003), while the authors urged caution in the use of Ambiguous Intentions and Hostility

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Questionnaire (AIHQ; Combs et al., 2007), Relationships Across Domains (Sergi et al., 2009), and Trustworthiness tasks (Adolphs et al., 1998), which had the weakest properties (Pinkham et al., 2016).

While the SCOPE study is an important effort to identify and validate social cognitive measures appropriate for use in psychosis treatment trials, further validation work, expanded to additional social cognition measures, is needed. Measures of social cognition are typically organized into biases (e.g., attributions) and skills (e.g., ToM) domains. Although these domains have each shown evidence of unidimensionality, there are also substantial differences between subdomains, differential relationships to important outcomes, and differential response to treatments (Bechi et al., 2012; Bora et al., 2006; Browne et al., 2016; Buck et al., 2016; Mancuso et al., 2011; Mehta et al., 2014; Schlaffke et al., 2015). While the SCOPE study identified one adequate emotion recognition and one adequate theory of mind (ToM) measure, additional psychometrically sound measures that comprehensively assess the various components of each domain (e.g. different types of ToM) may be needed.

The present data were collected in a treatment trial before SCOPE's results were published, but all but two SCOPE measures (RAD and Trustworthiness) were collected. Several less well-known measures were added to more comprehensively assess primary targets of the intervention, attributional style and theory of mind (Fiszdon et al., 2016). Two measures of attributions were added, The Internal, Personal, and Situational Attributions Questionnaire (IPSAQ; Kiderman, 1996) and Davos Assessment of Cognitive Biases Scale (DACOBS; van der Gaag et al., 2013). IPSAQ is relatively similar to AIHQ, requiring participants to speculate on their response to social interactions, while DACOBS measures a variety of attributional biases common to psychotic disorders through responses to yes or no questions. Attributions and related biases are thought to be particularly relevant to the development and maintenance of positive symptoms of psychosis (Howes and Murray, 2014; van der Gaag et al., 2013) and mood symptoms in mood and psychotic disorders (Alloy et al., 2006; Bentall et al., 1994). Other aspects of social cognition have been more closely related to negative symptoms (Sergi et al., 2007). Thus, relationship to symptoms was assessed in addition to other psychometrics. Attributions related to psychosis are relatively difficult to assess in psychosis as they are typically outside of one's awareness (e.g., Bortolotto et al., 2015), and one purpose of the present study is to assess if an attribution measure using endorsement rather than vignette responses may be more psychometrically sound while maintaining evidence of validity. We hope to identify a psychometrically adequate method to measure this important domain of treatment effects.

Aims of the present study were to: 1) replicate findings of the SCOPE study in an independent sample; and 2) extend this avenue of inquiry by evaluating additional measures of ToM and attributions. We examined test-retest reliability, utility as a repeated measure, relationship to neurocognitive and other social cognitive measures as well as symptoms and functioning, and unique power in predicting symptoms and functioning in nine social cognitive measures. For a subgroup of participants, information about sensitivity of these measures to a social cognitive treatment, a key consideration in clinical trial measure selection, was also available.

## 2. Methods

### 2.1. Participants

Forty eight outpatients with psychotic disorder diagnoses, confirmed via Structured Clinical Interview for DSM-IV (First and Gibbon, 2004), were recruited from local clinics and by word of mouth. Eligibility requirements included: age 18 or older; no evidence of developmental disability in chart or baseline assessment; minimum of 90 days since discharge from last hospitalization and 60 days since last psychiatric medication change; no current (30 days) substance use disorder

diagnosis; English as primary language; and no severe, uncorrected auditory or visual impairment or known neurological disorder. Written informed consent was obtained from all participants or legally authorized representatives, and the study was approved by all relevant local Institutional Review Boards.

### 2.2. Procedures

Social cognitive, symptom and functional assessments were conducted at baseline and again about one month later (average = 33.19 days, SD = 4.08). Premorbid IQ was assessed only at first baseline and neurocognition was assessed only during the 1-month re-assessment. A portion of the sample ( $n = 38$ ) had also been invited to participate in an 8-week social cognitive intervention (see Fiszdon et al., 2016 for details), following which they again completed the social cognitive, symptom, functional and neurocognitive assessments. TASIT version A was used during the first baseline, version B during the 1-month re-assessment and version B again following the social cognitive intervention. Fiszdon et al. (2016) Understanding Social Situations (USS) intervention used drill-and-practice, bottom-up scaffolded training focused on ToM, specifically social interpretations, in addition to one module specifically focused on implicit bias modification. The 38 participants in the treatment study were selected if they had a half-standard-deviation impairment on one of several measures of ToM and attributional bias. Given the targets of the USS intervention, treatment-related changes (i.e., treatment sensitivity) were only expected for measures in these two domains.

### 2.3. Measures

#### 2.3.1. Symptom, neurocognitive, and functioning measures

All measures are described in more detail in Fiszdon et al. (2016). Psychiatric symptom severity was assessed using the five-factor solution (Bell et al., 1994) for the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987), a 30-item interviewer-rated scale, where higher scores indicate greater symptom severity. The five-factor solution includes Negative, Positive, Cognitive, Emotional Discomfort (Anxiety, Depression, and Guilt items), and Hostility (Poor Impulse Control, Uncooperativeness, and Excitement items). The Wide Range Achievement Test 3, Reading subtest (WRAT-3 Reading; Jastak and Wilkinson, 1993) was used to assess premorbid intelligence. The MATRICS Cognitive Consensus Battery (MCCB; Nuechterlein et al., 2004) was used to assess cognitive functioning. An average T-score for neurocognitive performance was calculated based on six cognitive domains, excluding the social cognitive domain (MSCEIT; Mayer et al., 2003). Functioning was assessed using the Quality of Life Scale (QLS; Heinrichs et al., 1984), which consists of 21 interviewer-rated items assessing intrapsychic foundations, interpersonal relations, instrumental role function, and ownership of common objects and participation in common activities.

#### 2.3.2. Social cognition measures: attributions

Attributional and causality biases were assessed with several measures. IPSAQ (Kiderman, 1996) measures participants' perceptions of causality for positive and negative events, with subscales of Personalizing Bias (negative events are caused by others, not circumstances) and Externalizing Bias (negative events are not caused by self). AIHQ (Combs et al., 2007) measures social cognitive biases, with subscales hostility, blaming others, and aggressive response styles. Analyses focused on vignettes with ambiguous causality. DACOBS (van der Gaag et al., 2013) is a relatively new self-report measure of cognitive bias. Participants rate 41 items on a seven-point Likert scale indicating the degree to which they agree with statements about cognitive biases such as jumping to conclusions, belief inflexibility, selective attention for threat, subjective cognitive problems, subjective social cognitive problems, and safety behaviors. The scale was developed to assess cognitive biases that play a specific role in positive symptoms of psychosis

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