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Social cognition in schizophrenia: Factor structure of emotion processing and theory of mind

Julia Browne^{a,*}, David L. Penn^{a,b}, Tenko Raykov^c, Amy E. Pinkham^{d,e}, Skylar Kelsven^d, Benjamin Buck^a, Philip D. Harvey^{f,g}^a Department of Psychology, University of North Carolina, Chapel Hill, NC, United States^b School of Psychology, Australian Catholic University, Melbourne, VIC, Australia^c Measurement and Quantitative Methods, Michigan State University, East Lansing, MI, United States^d School of Behavioral and Brain Sciences, The University of Texas at Dallas, Richardson, TX, United States^e Department of Psychiatry, University of Texas Southwestern Medical School, Dallas, TX, United States^f Department of Psychiatry and Behavioral Sciences, University of Miami Miller School of Medicine, Miami, FL, United States^g Research Service, Miami VA Healthcare System, United States

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ABSTRACT

Factor analytic studies examining social cognition in schizophrenia have yielded inconsistent results most likely due to the varying number and quality of measures. With the recent conclusion of Phase 3 of the Social Cognition Psychometric Evaluation (SCOPE) Study, the most psychometrically sound measures of social cognition have been identified. Therefore, the aims of the present study were to: 1) examine the factor structure of social cognition in schizophrenia through the utilization of psychometrically sound measures, 2) examine the stability of the factor structure across two study visits, 3) compare the factor structure of social cognition in schizophrenia to that in healthy controls, and 4) examine the relationship between the factors and relevant outcome measures including social functioning and symptoms. Results supported a one-factor model for the patient and healthy control samples at both visits. This single factor was significantly associated with negative symptoms in the schizophrenia sample and with social functioning in both groups at both study visits.

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1. Introduction

Social cognition is a significant research target in schizophrenia due to its relationship with functional outcomes (Couture et al., 2006; Fett et al., 2011; Green and Leitman, 2008). Moreover, social cognitive interventions improve specific social cognitive skills, negative symptoms, and social functioning (Kurtz and Richardson, 2011; Lindenmayer et al., 2013; Roberts et al., 2014). However, despite the associations between social cognition and real world functioning in schizophrenia, research and treatment progress has been impeded by inconsistencies in construct definition and measurement (Pinkham et al., 2013). Previous research has utilized varying definitions and measures of social cognition in this population, leading to challenges in comparing results across studies (Green et al., 2005). Further, most existing measures of social cognition have unsatisfactory or unknown psychometric properties (Pinkham et al., 2015; Yager and Ehmann, 2006), thus precluding a valid understanding of its underlying factor structure.

* Corresponding author.

E-mail address: jbrowne@unc.edu (J. Browne).

The majority of existing factor analytic studies have established social cognition as distinct from related constructs such as neurocognition (Allen et al., 2007; Hoe et al., 2012; Mehta et al., 2013; Nuechterlein et al., 2004; Sergi et al., 2007; Van Hooren et al., 2008) and metacognition (Lysaker et al., 2013). In addition, the factor structure of social cognition in schizophrenia has yielded two-factor (Buck et al., 2016; Ziv et al., 2011), three-factor (Mancuso et al., 2011; Mehta et al., 2014), and four-factor solutions (Bell et al., 2009). Due to the differing conceptualizations of social cognition and a wide array of measures with unknown psychometric properties utilized in previous work, the genuine factor structure remains unknown. Fortunately, the recent conclusion of phase 3 of the Social Cognition Psychometric Evaluation (SCOPE) study offers a valuable opportunity to examine the factor structure of social cognition in schizophrenia using only the most psychometrically sound measures.

The SCOPE Study seeks to address the problem of inconsistent definition and measurement of social cognition by identifying the most widely used measures, systematically evaluating the psychometric properties, and validating a gold-standard battery for assessing these domains (Pinkham et al., 2013). Phases 1 and 2 of the project utilized expert surveys and the RAND Appropriateness

Method of consensus development to select the best existing measures based on current knowledge of their psychometric properties and their potential for use in clinical trials. Despite varying views on the number of domains comprising social cognition, eight measures of social cognition covering four domains (emotion processing, social perception, theory of mind/mental state attribution, and attributional style/bias) and one “novel” category were identified in the SCOPE study (Pinkham et al., 2013). The novel category included measures that “showed promise but were not widely used in schizophrenia” (Pinkham et al., 2013, p. 821).

In phase 3, large samples of individuals with schizophrenia and healthy controls completed the measures to assess the psychometric properties (e.g. reliability and validity) of each task (Pinkham et al., 2015). As a result of SCOPE Phase 3, the most widely used measures of all four domains of social cognition have been examined and the most psychometrically sound have been identified. Specifically, five measures of social cognition (described in the methods section) from the emotion processing and theory of mind domains were selected. Given that measures from the additional two social cognition domains (social perception and attributional style) did not exhibit sufficient reliability and validity in Phase 3, they will not be included in the present study. Further, the subsequent phase of SCOPE (currently in progress) is focused on identifying and testing different measures of these domains to establish a complete gold-standard battery of social cognition measures.

In this article, we report the results of a confirmatory factor analysis of social cognition in individuals with schizophrenia using the 5 most psychometrically sound measures identified in SCOPE Phase 3. This study has the potential to significantly impact the field in four important ways: 1) examine the factor structure of social cognition in schizophrenia through the utilization of psychometrically sound measures, 2) examine the stability of the factor structure through its examination at two visits, 3) compare the factor structure of social cognition in schizophrenia to that in healthy controls, and 4) examine the relationship between the factors and relevant outcome measures including social functioning and symptoms [Tables 1 and 2](#).

Table 1
Demographic and Clinical Characteristics.

| | SZ Sample (n = 179) | HC Sample (n = 104) |
|---|---------------------|---------------------|
| Male, % (n) [*] | 65 (117) | 47 (49) |
| Race, % (n) | | |
| Caucasian | 42 (76) | 41 (43) |
| African American | 53 (94) | 53 (55) |
| Native American | 1 (1) | 0 (0) |
| Asian | 2 (4) | 4 (4) |
| Other | 2 (4) | 2 (2) |
| Ethnicity, % (n) | | |
| Hispanic | 21 (37) | 20 (21) |
| Non-Hispanic | 79 (142) | 80 (83) |
| Age (years), M (SD) | 42.11 (12.32) | 39.20 (13.70) |
| Years of Education, M (SD) [*] | 12.70 (2.14) | 13.43 (1.66) |
| Diagnosis, % (n) | | |
| Schizophrenia | 54 (96) | – |
| Schizoaffective Disorder | 46 (83) | – |

Note. SZ = Schizophrenia; HC = Healthy Control.

^{*} p < 0.01.

Table 2
Descriptive data of social cognitive, neurocognitive, and social functioning measures.

| | SZ Sample M (SD) | HC Sample M (SD) |
|--|---------------------|---------------------|
| Social Cognitive Measures (T₁)^a | n = 179 | n = 104 |
| BLERT | 13.17 (3.88) | 15.75 (2.88) |
| ER-40 | 29.55 (5.40) | 32.80 (3.54) |
| Eyes | 20.15 (5.46) | 23.55 (4.62) |
| Hinting | 13.59 (3.87) | 16.82 (2.05) |
| TASIT | 44.43 (7.64) | 51.48 (5.62) |
| Social Cognitive Measures (T₂)^b | n = 171 | n = 98 |
| BLERT | 13.91 (3.99) | 16.12 (2.96) |
| ER-40 | 30.42 (4.95) | 33.13 (3.41) |
| Eyes | 20.66 (5.85) | 23.55 (5.34) |
| Hinting | 14.22 (3.69) | 17.44 (1.49) |
| TASIT | 42.92 (6.36) | 48.21 (6.58) |
| Neurocognitive Measures^c | n = 178 | n = 104 |
| Trails A | 41.06 (18.78) | 30.72 (12.10) |
| Coding | 42.18 (11.78) | 53.99 (14.00) |
| HFLT | 20.27 (5.37) | 24.85 (4.45) |
| LNS | 11.37 (4.07) | 13.85 (3.85) |
| AF | 18.44 (5.12) | 21.98 (6.36) |
| Social Functioning Measures^d | n = 178 | n = 103 |
| UPSA-B | 69.95 (14.36) | – |
| SSPA | 4.11 (0.534) | 4.52 (0.440) |
| SLOF | 3.91 (0.570) | 4.62 (0.440) |

Note. SZ = Schizophrenia; HC = Healthy Control; T₁ = Time 1; T₂ = Time 2; BLERT = Bell Lysaker Emotion Recognition Task; ER-40 = Penn Emotion Recognition Task; Eyes = Reading the Mind in the Eyes Test; Hinting = Hinting Task; TASIT = The Awareness of Social Inferences Test, Part III; LNS = Letter Number Span, AF = Animal Fluency; UPSA-B = UCSD Performance-Based Skills Assessment, Brief; SSPA = Social Skills Performance Assessment; SLOF = Specific Levels of Functioning Scale.

^a T₁ Hinting data was missing for 1 SZ subject and 2 HC subjects.

^b T₂ Hinting data was missing for 1 HC subject and T₂ TASIT data was missing for 1 SZ subject.

^c HFLT data was missing for 2 SZ subjects and LNS data was missing for 1 SZ subject.

^d SSPA and SLOF data were missing for 1 SZ subject.

2. Method

2.1. Subjects

The study took place at two sites, Southern Methodist University (SMU) and the University of Miami Miller School of Medicine (UM). Patients at the SMU site were recruited from Metrocare Services, a non-profit mental health services provider organization in Dallas County, TX, and other area clinics. UM patient recruitment occurred at the Miami VA Medical Center and the Jackson Memorial Hospital-University of Miami Medical Center. At both sites, healthy controls (n = 104) were recruited via community advertisements.

To be eligible, patients (n = 179) required a DSM-IV diagnosis of schizophrenia or schizoaffective disorder as confirmed by clinical interview with the MINI (Sheehan et al., 1998) and SCID Psychosis Module (First, Spitzer, Gibbon, and Williams, 2002). Patients could not have any hospitalizations within the last two months and had to be on a stable medication regimen for a minimum of six weeks with no dose changes for a minimum of two weeks. Healthy controls (n = 104) were screened for history of psychopathology to ensure they did not meet criteria for any major DSM-IV Axis I or II disorders. Exclusion criteria for both groups included: 1) presence or history of pervasive developmental disorder or mental retardation (defined as IQ < 70) by DSM-IV criteria, 2) presence or history of medical or neurological disorders that may affect brain function (e.g. seizures, CNS tumors, or loss of consciousness for 15 min or more), 3) presence of sensory limitation including visual (e.g. blindness, glaucoma, vision uncorrectable to 20/40) or hearing impairments that interfere with assessment, 4) no proficiency

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