



Evaluating social skill in individuals with schizophrenia with the brief impression questionnaire (BIQ)

Isabelle Lanser^{a,*}, Julia Browne^b, Amy E. Pinkham^{c,d}, Philip D. Harvey^{e,f}, L. Fredrik Jarskog^g, David L. Penn^{b,h}

^a Department of Psychology, University of California, Los Angeles, CA, United States

^b Department of Psychology and Neuroscience, University of North Carolina, Chapel Hill, NC, United States

^c School of Behavioral and Brain Sciences, The University of Texas, Dallas, Richardson, TX, United States

^d Department of Psychiatry, University of Texas Southwestern Medical School, Dallas, TX, United States

^e Department of Psychiatry and Behavioral Sciences, University of Miami Miller School of Medicine, Miami, FL, United States

^f Research Service, Miami VA Healthcare System, Miami, FL, United States

^g North Carolina Psychiatric Research Center, Department of Psychiatry, University of North Carolina, Chapel Hill, United States

^h School of Psychology, Australian Catholic University, Melbourne, VIC, Australia

ARTICLE INFO

Key words:

Social skill
Social functioning
Schizophrenia
Social cognition

ABSTRACT

Current social skill assessments for individuals with schizophrenia require extensive administration times, training, and coding procedures, thus limiting their clinical utility. The purpose of this study was to investigate the psychometric properties of the Brief Impression Questionnaire (BIQ), a novel measure designed to utilize immediate impression formation in the assessment of social skill in schizophrenia. An exploratory factor analysis of the BIQ was conducted, and relationships between the extracted factors and measures of social cognition and functioning were assessed. Additionally, we assessed differences on the BIQ between individuals with schizophrenia and control participants. Twenty-two research assistants at three sites rated participants using the BIQ (154 control participants and 218 individuals with schizophrenia). The results revealed identical one-factor structures for both participant groups. For both groups, the BIQ total score was positively associated with performance on social cognitive and everyday functioning assessments. Further, control participants were rated more positively on all BIQ items and received higher BIQ total scores. In the schizophrenia sample, BIQ scores predicted performance on social functioning assessments while controlling for symptom severity. These results indicate that impression formation may be a viable and efficient tool to measure aspects of social cognition and functioning in people with schizophrenia.

1. Introduction

Deficits in social cognition and social functioning have been repeatedly observed in individuals with schizophrenia (Savla et al., 2013). Social cognition encompasses theory of mind, emotion perception, social perception, and attributional style (Pinkham et al., 2015). Social functioning is defined as one's ability to engage with and fulfill social roles within one's social network (Bosc, 2000). Social cognition and functioning are important indicators of recovery from psychosis and can serve as protective factors against relapse (Barrowclough and Tarrier, 1990; Ritsner et al., 2012; Yanos et al., 2001).

Global social functioning is often targeted through social skills training interventions (Bellack and Mueser, 1993). Social skills are the building blocks of social functioning and include the skills needed to

perform daily life tasks, acquire and maintain employment, and build effective relationships (Bustillo, 2001). These skills are taught using highly structured interventions that utilize modeling, role-playing, and social reinforcement procedures to teach and shape appropriate social behavior (Bellack et al., 2013). Randomized controlled trials of stand-alone social skills training interventions have demonstrated moderate to large effect sizes on social functioning domains beyond skill mastery, such as social adjustment, independent living, and negative symptoms (Kurtz et al., 2016; Kurtz and Mueser, 2008).

Given the importance of social functioning in schizophrenia, there has been an increased focus on developing valid assessment tools (Harvey et al., 2011; Kopelowicz et al., 2006; Leifker et al., 2011). Such social functioning assessments generally fall into two categories: indirect assessment (e.g., self and informant reports) and direct

* Corresponding author.

E-mail address: ilanser@g.ucla.edu (I. Lanser).

<https://doi.org/10.1016/j.psychres.2018.08.047>

Received 14 February 2018; Received in revised form 9 July 2018; Accepted 13 August 2018

Available online 15 August 2018

0165-1781/ © 2018 Elsevier B.V. All rights reserved.

assessment (e.g., role-play tasks), and both exhibit significant limitations (Patterson et al., 2001). Specifically, self-reports often provide differing evaluations of the participant's social functioning than informant reports, likely due to self-assessment deficits in individuals with schizophrenia (Gould et al., 2013; Gould et al., 2015; Harvey et al., 2007; Lysaker et al., 2007; Silberstein et al., 2018; Waldheter et al., 2005). Additionally, there is evidence that self-reported functioning is not associated with performance-based measures of functioning in individuals with schizophrenia (Durand et al., 2015). Overestimation and underestimation biases in self-reports made by individuals with schizophrenia are influenced by symptom factors such as delusions, suspiciousness, grandiosity, and depressive symptoms (Sabbag et al., 2012; Harvey et al., 2017). Additionally, the type of informant completing an indirect assessment (e.g., family member, clinician, friend, etc.) may vary between participants, thus compromising reliability of these tools (Sabbag et al., 2011). Such discrepancies make it difficult to compare reports between subjects because different informants may be evaluating the subject based on experiences in varying contexts, such as social, vocational, or residential (Beck et al., 1991).

The primary limitations of direct assessments are the resources required to train staff to adequate reliability standards, the administration time, and the lengthy processes required to code them (Bellack et al., 1993; Mausbach et al., 2009; Patterson et al., 2001). Rapid changes in everyday functional demands lead to the risk of performance-based measures becoming outdated. Moreover, the field has yet to reach a consensus on whether direct or indirect assessment of social functioning should be considered the standard practice (Burns & Patrick, 2007; Patterson et al., 2001). Further, although many measures are available for use in clinical and research settings, the constructs assessed by each measure may capture disparate aspects of social functioning, and are thus, not always compatible with one another (Priebe, 2007). As a result, there is a critical need for novel, valid, and reliable social skill assessment tools (Horan and Green, 2017).

Implicit inference, though underutilized in the field of schizophrenia research, may provide a valuable avenue for assessing social functioning in individuals with schizophrenia without some of the limitations of current measures. These inferences are impressions that are made about an individual's disposition based on observations and subsequently utilized to create judgments and expectations of that individual (Ham and Vonk, 2003). The accuracy of spontaneous impressions of others has been established in the general population (Carney et al., 2007; Uleman et al., 2008). However, few clinical studies have evaluated whether spontaneous trait inference can provide clinically meaningful information. Miers et al. (2010) found that unfamiliar peer-aged observers could accurately distinguish between non-socially anxious and socially anxious adolescents on four domains of social skill: speech content, facial expressions, posture and body movement, and way of speaking from rating a short speech segment (less than five minutes). These findings shed light on the potential utility of impression formation as an assessment tool for evaluating social skill and social functioning. Given the accuracy of spontaneous impressions (Carney et al., 2007; Miers et al., 2010; Uleman et al., 2008) and the speed with which they are formed (Bar et al., 2006), measures that rely upon them could be valuable in assessing social functioning in schizophrenia.

The Brief Impression Questionnaire (BIQ) is a novel impression formation measure developed for use in the Social Cognition Psychometric Evaluation (SCOPE) study (Pinkham et al., 2016; Pinkham et al., 2018) that asks research assistants to quantify their impressions of an individual based on six items. These items assess both general characteristics of the participant and the research assistant's willingness to socially interact with the participant in the future. The present study investigated the structure and utility of the BIQ by: 1) examining its factor structure; 2) examining group differences in the BIQ between individuals with schizophrenia and healthy control subjects, and 3) exploring the relationships between the BIQ, and social cognition and social functioning measures for healthy control

participants and individuals with schizophrenia.

2. Methods

2.1. Setting and participants

The present study took place at three sites: University of Miami (UM), University of North Carolina at Chapel Hill (UNC), and University of Texas at Dallas (UTD). Individuals with schizophrenia at the UTD site were recruited from Metrocare Services, a nonprofit mental health services provider organization in Dallas County, TX, and other area clinics. Individuals with schizophrenia at the UM site were recruited from the two large medical centers in the area. Individuals with schizophrenia at the UNC site were recruited from two university-affiliated clinics. Community advertisements were used to recruit healthy controls at all sites. For information on statistically significant site differences in demographics in the schizophrenia sample, please refer to Pinkham et al. (2018) supplementary Table 2. Overall, UNC schizophrenia participants were more likely to be Caucasian and have higher IQ and education levels.

Inclusion criteria for schizophrenia participants were as follows: 1) a DSM-IV diagnosis of schizophrenia or schizoaffective disorder as confirmed by clinical interview with the MINI and SCID Psychosis Module (First et al., 2002; Sheehan et al., 1998), 2) no hospitalizations within the last two months, and 3) a stable medication regimen for at least six weeks with no dose changes for a minimum of two weeks. Healthy controls did not meet criteria for any major DSM-IV Axis I or II disorders as assessed using selected SCID modules. Exclusion criteria for both groups included: 1) current or past pervasive developmental disorder or intellectual disability (defined as $IQ < 70$) by DSM-IV criteria, 2) current or past medical or neurological disorders that may affect brain function (e.g. seizures, CNS tumors, or loss of consciousness for 15 minutes 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 in English, 5) presence of substance abuse in the past month, and 6) presence of substance dependence not in remission for the past six months. The Wide Range Achievement Test—Third Edition (WRAT-3) was administered to confirm English proficiency and estimate verbal IQ for inclusion in this study (Wilkinson, 1993).

The sample comprised 372 individuals (154 healthy control, 218 schizophrenia) who participated in Phase 5 of the Social Cognition Psychometric Evaluation (SCOPE) study (Pinkham et al., 2018). Participants were mostly male (64%) and middle-aged ($M = 41.8$, $SD = 11.9$, range: 19–64; Table 1). A total of 22 research assistants (77% female; Mean age = 25.83, $SD = 3.98$) from the three sites completed BIQ assessments.

In service of the third aim of this study, to explore whether aspects of social functioning and/or social cognition measures were captured by the BIQ, a subset of measures from the SCOPE study were included in the present analysis, specifically the social cognition and functioning measures. Only these measures are described in detail in the following sections (See Pinkham et al., 2018 for details on additional measures).

2.2. Social cognition measures

2.2.1. Observational ratings of social cognition

The Observable Social Cognition Rating Scale (OSCARS) is an 8-item interview designed to assess four domains of social cognition—emotion perception, theory of mind, attributional style/bias, and social perception—in outpatients diagnosed with schizophrenia (Healey et al., 2015). The total score received on the OSCARS was used in analyses. Healthy control individuals completed the OSCARS self-report rating form. Self and informant reports of the OSCARS were obtained for schizophrenia individuals. Higher scores indicate more impaired social cognitive performance.

Table 1
Demographic characteristics of schizophrenia and healthy control participants.

	Healthy Controls (n = 154)	Schizophrenia (n = 218)
Age	M = 41.95 (SD = 12.42)	M = 41.72 (SD = 11.64)
Gender		
Male	97 (63.0%)	142 (65.1%)
Female	57 (37.0%)	76 (34.9%)
Race		
Asian	4 (2.6%)	6 (2.8%)
Black or African American	62 (40.3%)	87 (39.9%)
White	80 (51.9%)	115 (52.8%)
Other	8 (5.2%)	7 (3.2%)
Ethnicity		
Hispanic or Latino	26 (16.9%)	33 (15.1%)
Not Hispanic or Latino	128 (83.1%)	185 (84.9%)
Highest Level of Education		
Higher than College	11 (7.1%)	8 (3.7%)
Completed College, 4 year Degree	44 (28.6%)	30 (13.8%)
Some Post-Secondary School, No Degree	58 (37.7%)	85 (39.0%)
Completed High School, Diploma	37 (24.0%)	51 (23.4%)
Attended High School, No Diploma	3 (1.9%)	36 (16.5%)
Middle School or Less	1 (0.6%)	8 (3.7%)
Primary Diagnosis		
Schizophrenia	N/A	110 (50.5%)
Schizoaffective Disorder	N/A	106 (48.6%)
First Episode Schizophrenia Spectrum Disorder	N/A	2 (0.9%)
Secondary Diagnosis		
Depression	N/A	17 (7.8%)
Bipolar Disorder	N/A	22 (10.1%)
Substance Use Disorder	N/A	1 (0.5%)
Other	N/A	17 (7.8%)
N/A	N/A	161 (73.9%)
Current Employment Status		
Unemployed	29 (18.8%)	51 (23.4%)
Disability/Unemployed	5 (3.2%)	99 (45.4%)
Disability/Part-Time Employment	0 (0.0%)	20 (9.2%)
Full-Time Student	9 (5.8%)	5 (2.3%)
Employed Part Time	29 (18.8%)	22 (10.1%)
Employed Full Time	68 (44.2%)	14 (6.4%)
Retired/Unemployed	2 (1.3%)	1 (0.5%)
Residential Status		
Independent and Financially Responsible	140 (90.9%)	138 (63.3%)
Independent and Not Financially Responsible	11 (7.1%)	57 (26.1%)
Unsupervised Residential Facility	2 (1.3%)	10 (4.6%)
Supervised Residential Facility	1 (0.6%)	13 (6.0%)
Cognitive Functioning		
WRAT-3	101.11(14.64)	94.78(14.64)

Note. WRAT-3 = Wide Range Achievement Test, Third Edition

2.2.2. Emotion perception

The Penn Emotion Recognition Task (ER-40) and the Bell-Lysaker Emotion Recognition Task (BLERT) were used to assess emotion perception (Bryson et al., 1997; Kohler et al., 2003). The total number of correct responses was used in analyses, with higher scores indicative of better emotion perception.

2.2.3. Theory of mind

The Hinting Task, Reading the Mind in the Eyes Task (Eyes), and The Awareness of Social Inference Test (TASIT, Part III) were used to assess theory of mind. The Hinting Task assesses theory of mind (ToM) using ten short stories, each presenting an interaction between two characters (Corcoran et al., 1995). The TASIT (McDonald et al., 2003)

asks participants to view 16 brief videotaped social interactions that depict sarcasm and “white lies” and answer questions about the intentions of the actors. The Eyes task presents participants with 36 black and white photographs of the eye region of different actors and actresses (Baron-Cohen et al., 1997). The total number of correct responses on each performance-based task was used in analyses, with higher scores indicating better theory of mind.

2.3. Social functioning measures

The 31-item version of the Specific Levels of Functioning (SLOF) scale was used to rate a participant's performance in four real-world dimensions of functioning: interpersonal relationships, social acceptability, participation in activities, and work skills (Schneider and Struenig, 1983). Healthy controls completed the self-report version of the SLOF and informants of the schizophrenia group completed the informant-report version. Schizophrenia participants selected an informant of their choosing and research assistants contacted the individual. Averaging the ratings on the individual items creates a composite score for each version of the SLOF, and participants with missing informant items were rated on the basis of all items completed. The present study used the total score, social acceptability subscale, and interpersonal functioning subscale in data analyses.

The Social Skills Performance Assessment (SSPA) assesses social skill and functioning (Patterson et al., 2001). The assessment features two role-plays, each lasting three minutes, performed by the participant and research assistant. These scenes are videotaped and later coded by an independent, expert rater blind to participant condition. Data analyses used the average score of the two scenes.

The UCSD Performance-based Skills Assessment, Brief (UPSA-B) was only administered to schizophrenia participants because it is designed to assess everyday functioning in people with severe mental illness using props and standardized role-plays (Mausbach et al., 2007). A total score was computed and used here.

2.4. Symptom measures

Symptoms were assessed in individuals with schizophrenia only using the Positive and Negative Syndrome Scale (PANSS), a 30-item inventory designed to assess symptomatology in a schizophrenia population on a continuum (Kay et al., 1987). Each item is rated from 1 to 7 (higher scores indicating more severe symptoms) yielding three subscales: positive symptoms, negative symptoms, and general psychopathology. Raters were trained to adequate reliability (ICC \geq .80 with a gold standard rater).

2.5. Brief impression questionnaire (BIQ)

The BIQ is a six-item questionnaire that asks research assistants to rate an individual on likability, easygoingness, friendliness, strangeness, how much they look forward to retesting the participant, and whether they would want to socialize with the participant (See Appendix). The BIQ was developed by the authors of the SCOPE study using items adapted from the positive traits subscale of the Impression Ratings Indices (Schultz and Maddox, 2013) and the Impression Questionnaire (Murphy-Berman and Berman, 1978). All items are rated on a 1-6-point Likert Scale (anchors: strongly disagree to strongly agree; higher scores are better; strangeness item reverse-scored).

2.6. Procedure

Participants completed measures of social cognition, social functioning, and symptoms at two study visits. Research assistants completed the BIQ immediately after each study visit. For the purposes of this exploratory paper, only data from the first visit were used in analyses.

Table 2
Descriptive statistics for BIQ items.

	Healthy Control (n = 154)	Schizophrenia (n = 218)	t-value	Cohen's d
BIQ	M(SD)	M(SD)		
Likability	5.06(0.96)	4.78(1.06)	2.64**	0.28
Friendliness	5.18(0.93)	4.88(1.03)	2.87**	0.31
Easygoing	5.15(0.95)	4.68(1.12)	4.37***	0.45
Likelihood to Retest the Participant	4.81(1.18)	4.39(1.40)	3.12**	0.32
Likelihood to Socialize with the Participant	3.69(1.46)	2.52(1.36)	7.98***	0.83
Strangeness (Reverse Scored)	4.86(1.42)	3.56(1.52)	8.46***	0.88
Total BIQ Score	28.75 (5.60)	24.81 (5.67)	6.63***	0.70

2.7. Data analysis

BIQ data were first examined using an exploratory factor analysis. Next, independent samples t-tests were used to assess group differences on the BIQ between schizophrenia and healthy control groups. To evaluate the relationship between the BIQ and existing social cognition and functioning measures, bivariate correlation analyses were conducted. Lastly, to further probe associations between the BIQ and social functioning measures, multiple linear regression was used to control for symptom severity. For all t-test, bivariate correlation, and regression analyses, alpha was set at 0.05.

3. Results

Analyses were performed using SPSS (version 24) and M-Plus 7 (IBM, 2016; Muthén and Muthén, 1988). Prior to conducting all analyses, the strangeness item on the BIQ was reverse coded such that higher scores indicated a rating of less strange (See Table 2 for descriptive statistics).

3.1. Exploratory factor analysis

The BIQ data were examined for possible nesting effects resulting from the number of research assistants. Single and multi-level models were examined. A single level model was selected as the most appropriate model for the data, based on the low intraclass correlations (ICCs) attained for the BIQ items, stability of the factor solution generated for the single level model, and the CFI value (CFI = 0.926) of the single-level model.

The iterated principal axis factoring extraction method was used because the sample was not normally distributed, and cutoff for item loading was 0.3 (Osborne and Costello, 2005). Rotation was not necessary to generate the factor loadings (Table 4).

Identical factor structures were produced for the healthy control and schizophrenia samples. For the healthy control data, the one-factor solution explained 64.9% of the variance (Table 3). The likability, easygoing, friendliness, and willingness to retest items had the strongest loadings (0.8 or higher). The strangeness item (reverse-scored) had the lowest loading (0.46). Given that this factor included all BIQ items, it was termed “Composite.”

For the schizophrenia sample, the one-factor solution explained 59.8% of the variance (Table 3). The likability, easygoing, and willingness to retest items had the highest factor loadings (above 0.8). The strangeness item had the lowest loading (0.46). This extracted factor was also labeled “Composite.”

Table 3
Descriptive statistics for SCOPE outcome measures.

	Healthy control (N = 154)	Schizophrenia (N = 218)
Social Cognition	M(SD)	M(SD)
BLERT Total Correct	15.92(2.70)	13.93(4.02)
ER40 Total Correct	32.94(3.19)	31.12(4.28)
Eyes Total Correct	24.79(4.33)	21.28(5.49)
Hinting Total Correct	15.38(2.68)	13.36(3.71)
TASIT Total Correct	50.57(6.80)	44.56(7.44)
OSCARS Self-Report	2.61(2.44)	4.49(2.47)
OSCARS Informant- Report	N/A	4.02(2.36)
Symptom Ratings		
PANSS Positive Factor	N/A	15.96(5.31)
PANSS Negative Factor	N/A	14.09(5.67)
PANSS General Factor	N/A	31.63(8.09)
PANSS Total Symptoms	N/A	61.68 (15.18)
Social Functioning		
SSPA Average	4.57(0.38)	4.13(0.55)
UPSA-B Total Score	N/A	70.70(14.09)
SLOF Informant-Report	N/A	4.12(0.64)
SLOF Self-Report	4.58(0.35)	4.12(0.58)

Note. BLERT = Bell-Lysaker Emotion Recognition Task; ER-40 = Penn Emotion Recognition Task; Eyes = Reading the Mind in the Eyes Task; Hinting = Hinting Task; TASIT = The Awareness of Social Inference Test; OSCARS = Observational Social Cognition, A Rating Scale; PANSS = Positive and Negative Syndrome Scale; SSPA = Social Skills Performance Assessment; UPSA-B = UCSD Performance-based Skills Assessment, Brief; SLOF = Specific Levels of Functioning, Self-Report
t-tests marked with an asterisk (*) were significant at $p < .05$
t-tests marked with a double asterisk (**) were significant at $p < .01$
t-tests marked with a triple asterisk (***) were significant at $p < .001$

Table 4
Factor loadings of BIQ.

	Healthy control N = 154	Schizophrenia N = 218
Item	Factor 1: Composite	Factor 1: Composite
Likability	.930	.894
Friendliness	.857	.699
Easygoing	.907	.840
Willingness to Retest Participant	.857	.856
Willingness to Socialize with Participant	.728	.517
Strangeness	.457	.463
Eigenvalue	4.176	3.587
% of Total Variance	64.909	59.786

3.2. Independent samples t-tests

Ratings on each item of the BIQ and the composite BIQ score (created by summing the BIQ items with strangeness reverse-coded) for healthy control and schizophrenia participants were compared. Healthy control participants were rated significantly higher on all items of the BIQ (Table 2).

3.3. Correlations with social cognition and social functioning measures

Bivariate correlations were conducted between the composite BIQ score and social cognition and social functioning assessments as well as PANSS symptom measures (Table 5). For healthy control participants, the total BIQ score was significantly and positively correlated with better social functioning as indexed by both the role-play task (SSPA) and the SLOF self-report.

For schizophrenia participants, higher ratings on the BIQ total score were associated with better performance on the emotion recognition

Table 5
Bivariate correlations among SCOPE measures and BIQ factors: healthy control and schizophrenia.

	Healthy control <i>N</i> = 154 BIQ total score	Schizophrenia <i>N</i> = 218 BIQ total score
Social Cognition		
BLERT Total Correct	.157 (N = 154)	.210** (N = 218)
ER40 Total Correct	.107 (N = 154)	.258*** (N = 218)
Eyes Total Correct	.076 (N = 154)	.191** (N = 218)
Hinting Total Correct	.054 (N = 154)	.304*** (N = 217)
TASIT Total Correct	.067 (N = 154)	.221** (N = 217)
OSCARS Self-Report	−0.145 (N = 153)	.046 (N = 217)
OSCARS Informant-Report	N/A	−0.075 (N = 130)
Symptom Ratings		
PANSS Positive Factor	N/A	−0.324*** (N = 218)
PANSS Negative Factor	N/A	−0.451*** (N = 218)
PANSS General Factor	N/A	−0.399*** (N = 218)
PANSS Total Symptoms	N/A	−0.502*** (N = 218)
Social Functioning		
SSPA Average	.199* (N = 152)	.398*** (N = 210)
UPSA-B Total Score	N/A	.176** (N = 208)
SLOF Informant-Report	N/A	.093 (N = 135)
SLOF-inf Social Acceptability	N/A	−0.173* (N = 135)
SLOF-inf Interpersonal Functioning	N/A	.062 (N = 135)
SLOF Self-Report	.182* (N = 153)	−0.054 (N = 178)
SLOF-sr Social Acceptability	.108 (N = 153)	−0.103 (N = 178)
SLOF-sr Interpersonal Functioning	.216** (N = 153)	.007 (N = 178)

Note. BLERT = Bell-Lysaker Emotion Recognition Task; ER-40 = Penn Emotion Recognition Task; Eyes = Reading the Mind in the Eyes Task; Hinting = Hinting Task; TASIT = The Awareness of Social Inference Test; OSCARS = Observational Social Cognition, A Rating Scale; PANSS = Positive and Negative Syndrome Scale; SSPA = Social Skills Performance Assessment; UPSA-B = UCSD Performance-based Skills Assessment; SLOF = Specific Levels of Functioning, Self-Report (sr) and Informant Report (inf).

Correlations marked with an asterisk (*) were significant at $p < .05$

Correlations marked with a double asterisk (**) were significant at $p < .01$

Correlations marked with a triple asterisk (***) were significant at $p < .001$

tasks (BLERT and ER40), on three ToM tasks (the Hinting task, Eyes, and TASIT), and on two performance-based social functioning measures (SSPA and UPSA-B). Higher ratings on the BIQ total score were associated with less severe positive, negative, general, and total symptoms. Total self-reported and informant-rated everyday functioning were not correlated significantly with BIQ scores; however, informant-rated social acceptability was associated with total scores on the BIQ, such that there was a marginal association between higher scores on the BIQ and lower social acceptability. However, it should be noted that the distribution of social acceptability scores was highly negatively skewed. Informant rated interpersonal functioning was not related to total scores on the BIQ.

3.4. Multiple linear regression analyses

The relationship between total BIQ scores and SSPA performance and UPSA-B performance was further assessed using multiple linear regression. Total PANSS symptoms scores were entered in the first block and total BIQ scores were entered in the second block. Models were run separately for the SSPA and UPSA-B as dependent variables. For average SSPA performance, the full model explained 17.3% of the variance ($F(2, 205) = 21.58, p < .001$). Participants with less severe symptoms exhibited better performance on the SSPA ($\beta = -0.30, p < .001$). Higher total BIQ scores were associated with better performance on the SSPA while controlling for total symptoms severity ($\beta = 0.33, p < .001$). For average UPSA-B performance, the full model explained 7.2% of the variance ($F(2, 205) = 7.99, p < .001$). Participants with less severe symptoms exhibited better performance on the UPSA-B ($\beta = -0.23, p < .01$). Higher total BIQ scores were not associated with better performance on the UPSA-B while controlling for total symptom severity ($\beta = 0.068, p = .40$).

4. Discussion

The goal of this study was to explore the structure and utility of the BIQ, a novel social skill measure. As such, this study examined the factor structure of the BIQ for healthy control participants and individuals with schizophrenia, group differences in BIQ ratings between the two groups, and the relationship between the BIQ and measures of social cognition and social functioning. A one-factor structure was suitable for both groups. These findings are consistent with work revealing similar factor structures of social cognition for both healthy control and schizophrenia individuals (Browne et al., 2016; van Hooren et al., 2008).

In terms of group differences, healthy control participants were rated more favorably than schizophrenia participants on all items of the BIQ and had higher overall scores on this measure. These findings suggest that the BIQ is sensitive to global differences in social skill that differentiate schizophrenia and healthy control participants.

The primary finding of this study was that the BIQ was significantly related to the SSPA, an observable social functioning measure, in both groups. Further in the schizophrenia group, the BIQ was associated with SSPA performance while controlling for total symptoms or employment status.¹ Therefore, it is likely that the BIQ captures social competence beyond the information obtained through symptom assessment. The SSPA assesses several domains of observable social skill, including social appropriateness, and has been widely used in the field of

¹ Given the potential for employment status to impact relationships between the BIQ and social functioning in the SCZ group, we ran post-hoc multiple linear regression analyses. Specifically, employment status (Yes/No) scores were entered in the first block and total BIQ scores were entered in the second block. Models were run separately for the SSPA and UPSA-B as dependent variables. The BIQ remained significantly related to the SSPA ($\beta = 0.40, p < .001$) and to the UPSA-B ($\beta = 0.21, p < .01$) when controlling for employment status.

schizophrenia research (Patterson et al., 2001; Fett et al., 2011). The finding that the BIQ scores were associated with performance on the SSPA is encouraging, as the SSPA is a well-established role-play measure that is rated by independent raters who have no other knowledge of the participants. Thus, the relationship between the BIQ and the SSPA suggests that the impressions captured by the BIQ may be a useful proxy of observable social skill in individuals with schizophrenia (and one requiring significantly less training). Moreover, the lack of a significant relationship between the BIQ and UPSA-B when controlling for symptoms underscores the specificity of these correlations to specific social functioning skills. In contrast to the SSPA, the UPSA-B does not assess social competence and measures several elements of functional skills needed for everyday functioning.

Additionally, in individuals with schizophrenia, the BIQ total score was related to several social cognition measures assessing theory of mind and emotion perception. This may be explained by the relevance of social cognitive skills in facilitating appropriate responses to others in conversation. Over the course of the several-hour session visit, research assistants had numerous opportunities to interact with participants during and between the various types of assessments. Thus, participants who were able to interact with the research assistants effectively at the beginning of the testing visit, between assessments, and at the end of the testing visit may have scored highly on the BIQ. Thus, while the BIQ ratings may be closely related to broadly observable social skill, its relationship with the social cognition measures highlights the relationship between social skill and supporting social cognitive abilities needed for appropriate conversation and behavior in interactions.

There are limitations associated with this study. First, there is a concern for the nesting of BIQ ratings within each research assistant because of the research assistant to participant ratio (22:372) (see Meirs et al., 2010 for similar concerns). However, ICCs generated for each item indicated limited within-rater similarity between participants, and a multi-level model factor structure was unstable and unsuitable for the data. Second, impressions captured by the BIQ may have been informed by performance on the social cognition and functioning measures and research assistants' knowledge of participant group status because the BIQ was completed after the full testing session. Third, because the BIQ was added to the SCOPE study protocol as an exploratory measure, only one research assistant rated each participant, preventing the assessment of interrater reliability. Fourth, there may have been demographic effects given that the research assistants were not matched on age and gender to the participants; however, the uneven distribution of gender among the research assistants precludes formal evaluation of this possibility. Importantly however, an independent coder who was blind to participant group and who did not have any contact with participants rated the SSPA. Thus, BIQ ratings likely captured aspects of participants' social presentation that could be evaluated without accompanying information regarding social cognitive or functioning ability. Fifth, given the exploratory nature of this study, a correction for multiple comparisons was not implemented. We also did not attempt to perform a confirmatory factor analysis because we did not have alternative substantive models to evaluate. Finally, correlations were small in magnitude, as were group differences on most of the BIQ individual items (although statistically significant) and thus, should be interpreted with caution. Though the effect sizes provided in Table 2 cannot speak to whether these differences are clinically meaningful, they range from 0.28–0.88 for the group differences on the BIQ individual items and the BIQ total score.

Future research should continue to investigate the utility of social inferences as a social skill assessment tool given these initial promising results and the brevity of the BIQ measure. For example, studies are needed to determine whether perceptions of social skill as rated on the BIQ differ between research assistants, licensed mental health professionals, and participants themselves. Additionally, future studies might want to investigate the extent to which other factors, such as

employment or educational attainment influence the relationship between the BIQ and social functioning assessments. Overall, the present study demonstrates initial promise of utilizing the BIQ as a measure of social skill in individuals with schizophrenia.

Acknowledgments

We would like to thank all of the individuals who participated in this study and the research assistants for all their work. IL conducted all analyses and certifies the accuracy of the results.

The SCOPE study was supported by the National Institute of Mental Health at the National Institutes of Health (R01 MH093432 to P.D.H., D.L.P., and A.E.P.).

Conflicts of interest

In the past year Dr. Harvey as served as a consultant to: Akili, Allergan, Boehringer-Ingelheim, Lundbeck, Minerva Pharma, Otsuka America, Sanofi, Sunovion, and Takeda. He has grants from Takeda and the Stanley Medical Research Foundation.

In the past year, Dr. Jarskog has received research grant funding from Auspex/Teva and Boehringer-Ingelheim.

All other authors report no biomedical conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2018.08.047.

References

- Bar, M., Neta, M., Linz, H., 2006. Very first impressions. *Emotion* 6, 269–278. <https://doi.org/10.1037/1528-3542.6.2.269>.
- Baron-Cohen, Baron-Cohen, S., Jolliffe, T., Mortimore, C., Robertson, M., Baron-Cohen, 1997. Another advanced test of theory of mind: evidence from very high functioning adults with autism or Asperger Syndrome. *J. Child Psychol. Psychiatry* 38, 813–822. <https://doi.org/10.1111/j.1469-7610.1997.tb01599.x>.
- Barrowclough, C., Tarrier, N., 1990. Social functioning in schizophrenic patients. *Soc. Psychiatry Psychiatr. Epidemiol.* 25, 125–129. <https://doi.org/10.1007/BF00782739>.
- Beck, C., Heacock, P., Mercer, S., Walton, C.G., Shook, J., 1991. Dressing for success. Promoting independence among cognitively impaired elderly. *J. Psychosoc. Nurs. Ment. Health Serv.* 29, 30–35.
- Bellack, A.S., Mueser, K.T., Gingerich, S., Agresta, J., 2013. *Social skills training for schizophrenia: A step-by-step guide*. Guilford Publications.
- Bosc, M., 2000. Assessment of social functioning in depression. *Comp. Psychiatry* 41, 63–69.
- Browne, J., Penn, D.L., Raykov, T., Pinkham, A.E., Kelsven, S., Buck, B., Harvey, P.D., 2016. Social cognition in schizophrenia: Factor structure of emotion processing and theory of mind. *Psychiatry Res* 242, 150–156. <https://doi.org/10.1016/j.psychres.2016.05.034>.
- Bryson, G., Bell, M., Lysaker, P., 1997. Affect recognition in schizophrenia: A function of global impairment or a specific cognitive deficit. *Psychiatry Res* 71, 105–113. [https://doi.org/10.1016/S0165-1781\(97\)00050-4](https://doi.org/10.1016/S0165-1781(97)00050-4).
- Bustillo, J.R., Lauriello, J., Horan, W.P., Keith, S.J., 2001. The psychosocial treatment of schizophrenia: An update. *Am. J. Psychiatry* 158, 163–175. <https://doi.org/10.1176/appi.ajp.158.2.163>.
- Carney, D.R., Colvin, C.R., Hall, J.A., 2007. A thin slice perspective on the accuracy of first impressions. *J. Res. Pers.* 41, 1054–1072. <https://doi.org/10.1016/j.jrp.2007.01.004>.
- Corcoran, R., Mercer, G., Frith, C.D., 1995. Schizophrenia, symptomatology and social inference: Investigating “theory of mind” in people with schizophrenia. *Schizophr. Res.* 17, 5–13. [https://doi.org/10.1016/0920-9964\(95\)00024-G](https://doi.org/10.1016/0920-9964(95)00024-G).
- Durand, D., Strassnig, M., Sabbag, S., Gould, F., Twamley, E.W., Patterson, T.L., Harvey, P.D., 2015. Factors influencing self-assessment of cognition and functioning in schizophrenia: Implications for treatment studies. *Eur. Neuropsychopharmacol.* 25, 185–191. <https://doi.org/10.1016/j.euroneuro.2014.07.008>.
- Fett, A.K.J., Viechtbauer, W., Dominguez, M., de, G., Penn, D.L., van Os, J., Krabbendam, L., 2011. The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: A meta-analysis. *Neurosci. Biobehav. Rev.* <https://doi.org/10.1016/j.neubiorev.2010.07.001>.
- First, M.B., Spitzer, R.L., Gibbon, M., Williams, J.B.W., 2002. *Structured clinical interview for DSM-IV-TR axis I disorders research version, patient edition with psychotic screen (SCID-I/P)*. Biomet. Res.
- Gould, F., McGuire, L.S., Durand, D., Sabbag, S., Larrauri, C., Patterson, T.L., Twamley, E.W., Harvey, P.D., 2015. Self-assessment in schizophrenia: Accuracy of evaluation of

- cognition and everyday functioning. *Neuropsychology* 29, 675–682. <https://doi.org/10.1037/neu0000175>.
- Gould, F., Sabbag, S., Durand, D., Patterson, T.L., Harvey, P.D., 2013. Self-assessment of functional ability in schizophrenia: Milestone achievement and its relationship to accuracy of self-evaluation. *Psychiatry Res* 207, 19–24. <https://doi.org/10.1016/j.psychres.2013.02.035>.
- Ham, J., Vonk, R., 2003. Smart and easy: Co-occurring activation of spontaneous trait inferences and spontaneous situational inferences. *J. Exp. Soc. Psychol.* 39, 434–447. [https://doi.org/10.1016/S0022-1031\(03\)00033-7](https://doi.org/10.1016/S0022-1031(03)00033-7).
- Harvey, P.D., Raykov, T., Twamley, E.W., Vella, L., Heaton, R.K., Patterson, T.L., 2011. Validating the measurement of real-world functional outcomes: Phase I results of the VALERO study. *Am. J. Psychiatry* 168, 1195–1201. <https://doi.org/10.1176/appi.ajp.2011.10121723>.
- Harvey, P.D., Twamley, E.W., Pinkham, A.E., Depp, C.A., Patterson, T.L., 2017. Depression in schizophrenia: Associations with cognition, functional capacity, everyday functioning, and self-assessment. *Schizophr. Bull.* 43, 575–582. <https://doi.org/10.1093/schbul/sbw103>.
- Harvey, P.D., Velligan, D.I., Bellack, A.S., 2007. Performance-based measures of functional skills: Usefulness in clinical treatment studies. *Schizophr. Bull.* 33, 1138–1148. <https://doi.org/10.1093/schbul/sbm040>.
- Healey, K.M., Combs, D.R., Gibson, C.M., Keefe, R.S.E., Roberts, D.L., Penn, D.L., 2015. Observable social cognition - a rating scale: an interview-based assessment for schizophrenia. *Cogn. Neuropsychiatry* 20, 198–221. <https://doi.org/10.1080/13546805.2014.999915>.
- Horan, W.P., Green, M.F., 2017. Treatment of social cognition in schizophrenia: Current status and future directions. *Schizophr. Res.* <https://doi.org/10.1016/j.schres.2017.07.013>.
- IBM Corp. Released, 2016. *IBM SPSS Statistics for Windows, Version 24.0*. IBM Corp., Armonk, NY.
- Kay, S., Fiszbein, A., Opler, L., 1987. The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophr. Bull.* 13, 261–276. <https://doi.org/10.1093/schbul/13.2.261>.
- Kohler, C.G., Turner, T.H., Bilker, W.B., Brensinger, C.M., Siegel, S.J., Kanes, S.J., Gur, R.E., Gur, R.C., 2003. Facial emotion recognition in schizophrenia: Intensity effects and error pattern. *Am. J. Psychiatry* 160, 1768–1774. <https://doi.org/10.1176/appi.ajp.160.10.1768>.
- Kopelowicz, A., Liberman, R.P., Zarate, R., 2006. Recent advances in social skills training for schizophrenia, in: *Schizophrenia Bulletin*. <https://doi.org/10.1093/schbul/sbl023>.
- Kurtz, M.M., Gagen, E., Rocha, N.B.F., Machado, S., Penn, D.L., 2016. Comprehensive treatments for social cognitive deficits in schizophrenia: A critical review and effect-size analysis of controlled studies. *Clin. Psychol. Rev.* 43, 80–89. <https://doi.org/10.1016/j.cpr.2015.09.003>.
- Kurtz, M.M., Mueser, K.T., 2008. A meta-analysis of controlled research on social skills training for schizophrenia. *J. Consult. Clin. Psychol.* 76, 491–504. <https://doi.org/10.1037/0022-006X.76.3.491>.
- Leifker, F.R., Patterson, T.L., Heaton, R.K., Harvey, P.D., 2011. Validating measures of real-world outcome: The results of the VALERO expert survey and RAND panel. *Schizophr. Bull.* 37, 334–343. <https://doi.org/10.1093/schbul/sbp044>.
- Lysaker, P.H., Roe, D., Yanos, P.T., 2007. Toward understanding the insight paradox: Internalized stigma moderates the association between insight and social functioning, hope, and self-esteem among people with schizophrenia spectrum disorders. *Schizophr. Bull.* 33, 192–199. <https://doi.org/10.1093/schbul/sbl016>.
- Mausbach, B.T., Harvey, P.D., Goldman, S.R., Jeste, D.V., Patterson, T.L., 2007. Development of a brief scale of everyday functioning in persons with serious mental illness. *Schizophr. Bull.* 33, 1364–1372. <https://doi.org/10.1093/schbul/sbm014>.
- McDonald, S., Flanagan, S., Rollins, J., Kinch, J., 2003. TASIT: A new clinical tool for assessing social perception after traumatic brain injury. *J. Head Trauma Rehabil.* 18, 219–238. <https://doi.org/10.1097/00001199-200305000-00001>.
- Miers, A.C., Blöte, A.W., Westenberg, P.M., 2010. Peer perceptions of social skills in socially anxious and nonanxious adolescents. *J. Abnorm. Child Psychol.* 38, 33–41. <https://doi.org/10.1007/s10802-009-9345-x>.
- Murphy-Berman, V., Berman, J., 1978. Impression questionnaire. <https://doi.org/10.1037/t18755-000>.
- Muthén, L.K., Muthén, B.O., 1998. *Mplus User's Guide*. -2011. Muthén and Muthén, Los Angeles, CA Sixth Edition.
- Osborne, J.W., Costello, A.B., 2005. Best practices in exploratory factor analysis: four recommendations for getting the most from your analysis. *Pract. Assessment, Res. Eval.* 10, 1–9.
- Patterson, T.L., Moscona, S., McKibbin, C.L., Davidson, K., Jeste, D.V., 2001. Social skills performance assessment among older patients with schizophrenia. *Schizophr. Res.* 48, 351–360. [https://doi.org/10.1016/S0920-9964\(00\)00109-2](https://doi.org/10.1016/S0920-9964(00)00109-2).
- Pinkham, A.E., Penn, D.L., Green, M.F., Harvey, P.D., 2016. Social cognition psychometric evaluation: Results of the initial psychometric study. *Schizophr. Bull.* 42, 494–504. <https://doi.org/10.1093/schbul/sbv056>.
- Pinkham, A.E., Harvey, P.D., Penn, D.L., 2018. Social cognition psychometric evaluation: results of the final validation study. *Schizophr. Bull.* 44, 737–748. <https://doi.org/10.1093/schbul/sbx117>.
- Ritsner, M.S., Arbitman, M., Lisker, A., Ponizovsky, A.M., 2012. Ten-year quality of life outcomes among patients with schizophrenia and schizoaffective disorder II. Predictive value of psychosocial factors. *Qual. Life Res.* 21, 1075–1084. <https://doi.org/10.1007/s11136-011-0015-4>.
- Sabbag, S., Twamley, E.M., Vella, L., Heaton, R.K., Patterson, T.L., Harvey, P.D., 2011. Assessing everyday functioning in schizophrenia: Not all informants seem equally informative. *Schizophr. Res.* 131, 250–255. <https://doi.org/10.1016/j.schres.2011.05.003>.
- Sabbag, S., Twamley, E.W., Vella, L., Heaton, R.K., Patterson, T.L., Harvey, P.D., 2012. Predictors of the accuracy of self assessment of everyday functioning in people with schizophrenia. *Schizophr. Res.* 137, 190–195. <https://doi.org/10.1016/j.schres.2012.02.002>.
- Savla, G.N., Vella, L., Armstrong, C.C., Penn, D.L., Twamley, E.W., 2013. Deficits in domains of social cognition in schizophrenia: A meta-analysis of the empirical evidence. *Schizophr. Bull.* 39, 979–992. <https://doi.org/10.1093/schbul/sbs080>.
- Schneider, L.C., Struening, E.L., 1983. SLOF: a behavioral rating scale for assessing the mentally ill. *Soc. Work Res. Abstr.* 19, 9–21. <https://doi.org/10.1093/swra/19.3.9>.
- Schultz, J.R., Maddox, K.B., 2013. Impression rating indices. <https://doi.org/10.1037/t26291-000>.
- Sheehan, D.V., Lecrubier, Y., Sheehan, K.H., et al., 1998. The mini-international neuropsychiatric interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *J. Clin. Psychiatr.* 59, 22–33.
- Silberstein, J.M., Pinkham, A.E., Penn, D.L., Harvey, P.D., 2018. Self assessment of social cognitive ability in schizophrenia: association with social cognitive test performance, informant assessments of social cognitive ability, and everyday outcomes. *Schizophr. Res.* <https://doi.org/10.1016/j.schres.2018.04.015>.
- Uleman, J.S., Adil Saribay, S., Gonzalez, C.M., 2008. Spontaneous inferences, implicit impressions, and implicit theories. *Annu. Rev. Psychol.* 59, 329–360. <https://doi.org/10.1146/annurev.psych.59.103006.093707>.
- van Hooren, S., Versmissen, D., Janssen, I., Myin-Germeys, I., à Campo, J., Mengelers, R., van Os, J., Krabbendam, L., 2008. Social cognition and neurocognition as independent domains in psychosis. *Schizophr. Res.* 103, 257–265. <https://doi.org/10.1016/j.schres.2008.02.022>.
- Waldheter, E.J., Jones, N.T., Johnson, E.R., Penn, D.L., 2005. Utility of social cognition and insight in the prediction of inpatient violence among individuals with a severe mental illness. *J. Nerv. Ment. Dis.* 193, 609–618. <https://doi.org/10.1097/01.nmd.0000177788.25357.de>.
- Wilkinson, Gary S. (1993). *Wide range achievement test: WRAT3*. Wilmington, DE: Los Angeles, Calif.:Wide Range, Inc.; Western Psychological Services [distributor].
- Yanos, P.T., Primavera, L.H., Knight, E.L., 2001. Consumer-run service participation, recovery of social functioning, and the mediating role of psychological factors. *Psychiatr. Serv.* 52, 493–500. <https://doi.org/10.1176/appi.ps.52.4.493>.