Observable Social Cognition: A Rating Scale: An Interview-Based Assessment for Schizophrenia

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Abstract

KRISTIN HEALEY: Observable Social Cognition: A Rating Scale: An Interview-Based Assessment for Schizophrenia
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Individuals with schizophrenia consistently show impairments in social cognition (SC). Current SC measures are hampered by methodological issues that limit use of SC as a viable treatment target. An alternative assessment method is to administer a scale incorporating an informant's impressions. The Observable Social Cognition: A Rating Scale (OSCARS) was administered to 62 outpatients and 50 non-psychiatric controls (NPCs) to assess SC performance. OSCARS demonstrated sufficient internal consistency and test-retest reliability. Construct validity was assessed through exploratory factor analysis. Patient OSCARS scores were not significantly correlated with measures of SC, with the exception of aggressive attributional style. Results indicated individuals with less impairment in SC reacted more aggressively to ambiguous situations. Control OSCARS scores were significantly correlated with measures of theory of mind and attributional style. In patients, OSCARS was significantly correlated with several measures of functioning and neurocognition. Implications for using OSCARS as an outcome measure will be discussed.

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List of Abbreviations

AIHQ: Ambiguous Intentions Hostility Questionnaire

AS: Attributional Style

AUC: Area Under the Curve

CAI: Cognitive Assessment Interview

CGI-CogS: Clinical Global Impression of Cognition in Schizophrenia

CR: Cognitive Rigidity

EFA: Exploratory Factor Analysis

EMP: Empathy

EP: Emotion Perception

ER40: Penn Emotion Recognition Task

FEDT: Face Emotion Discrimination Task

FEIT: Face Emotion Identification Task

GAF: Global Assessment of Functioning

GSFS: Global Social Functioning Scale

ICC: Intraclass Correlation Coefficient

JTC: Jumping To Conclusions

NC: Neurocognition

NPC: Non-psychiatric Control

OSCARS: Observable Social Cognition: A Rating Scale

PANSS: Positive and Negative Syndromes Scale

QLS-S: Quality of Life - Social

QLS-W: Quality of Life - Work

RFS: Role Functioning Scale

RMSEA: Root Mean Square Error of Approximation

ROC: Receiver Operating Characteristics

SC: Social Cognition

SCIT: Social Cognition and Interaction Training

SCoRS: Schizophrenia Cognition Rating Scale

SD: Standard Deviation

SOFAS: Social and Occupational Functioning Assessment Scale

SOPS: Scale of Prodromal Symptoms

SSPA: Social Skills Performance Assessment

TASIT: The Awareness of Social Inference Test

TAU: Treatment As Usual

TLI: Tucker Lewis Index

ToM: Theory of Mind

WASI: Wechsler Abbreviated Scales for Intelligence

1. Introduction

1.1. Overview of Social Cognition

Social cognition (SC) may be defined as a set of neurocognitive processes related to the understanding, recognition, processing, and appropriate use of social stimuli in one's environment (Adolphs, 2009; Ochsner, 2008; Penn, Corrigan, Bentall, Racenstein, & Newman, 1997). Individuals with schizophrenia consistently show impairments in SC across the following primary domains: attributional style, theory of mind (ToM), emotion perception, and associated underlying processes (Green, Olivier, Crawley, Penn, & Silverstein, 2005; Kohler, Walker, Martin, Healey, & Moberg, 2010; Penn, Sanna, & Roberts, 2008; Pijnenborg et al., 2009; Pinkham & Penn, 2006). SC has received considerable attention in the field of schizophrenia research over the past ten years due to its relationship with poor functional outcomes (Brekke, Kay, Lee, & Green, 2005; Couture, Penn, & Roberts, 2006; Nuechterlein et al., 2004). For example, there is a growing body of evidence suggesting that social cognition, specifically emotion perception and ToM, has a consistent relationship with functioning (Appelo et al., 1992; Brekke et al., 2005; Brune, 2005; Couture et al., 2006; Hooker & Park, 2002; Kee, Green, Mintz, & Brekke, 2003; Kohler et al., 2003; Mueser et al., 1996; Nuechterlein et al., 2004; Penn, Ritchie, Francis, Combs, & Martin, 2002; Pinkham & Penn, 2006; Schenkel, Spaulding, & Silverstein, 2005). A review of 22 studies on the relationship between social cognition and functioning found correlations between domains of emotion processing and ToM with social/community functioning, though the associations were

small to modest in size (Couture et al., 2006). And, recent findings from a meta-analysis indicate that SC has a stronger relationship with functional outcome than neurocognition (NC) (Fett et al., 2011).

1.2. Problems with measuring social cognition

Given the importance of social cognition to social functioning, it is critical to utilize valid and reliable measures to enhance our understanding of these constructs. Current measures have important methodological issues that limit the utility of social cognition as a viable treatment target. First and most broadly, SC tasks' psychometric properties are often not well established, with consistent ceiling effects and little data regarding norms, practice effects and sensitivity to change (Bora, Yucel, & Pantelis, 2009; Yager & Ehmann, 2006). Thus, it is critical to evaluate the psychometric properties of both established and new tests (i.e. construct validity, reliability, normative standards, distribution of scores and practice effects).

Second, current SC tasks have significant conceptual and measurement-related overlap (Green et al., 2008). For example, the Eyes task prompts subjects to label pictures of eyes with a word that best categorizes their interpretation of the person's experience (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997). This task is meant to assess ToM, but also likely involves aspects of emotion perception as well. Third, there is no consensus concerning which SC measures best capture a given domain or construct. This results in administration of a heterogeneous group of tasks with inconsistent findings (Bora et al., 2009). As stated in a recent commentary by Yager and Ehrmann (2006), "There are few widely accepted standardized measures of social cognition that are available for use with schizophrenic populations." (p. 61). Thus, such problems call for

the supplementation of existing measures with novel methods of assessing SC.

1.3. Observer-based scales

An alternative approach to measuring SC deficits is to administer an observer-based rating scale. Such a scale utilizes "first hand" ratings from individuals that have witnessed the individual interact in a naturalistic social setting. This method was used for the Schizophrenia Cognition Rating Scale (SCoRS), an interview-based measure that considers informant reports, or information from individuals that had the most regular contact with the patient in everyday situations (i.e. family members, significant others, friends, social workers). Informant information and patient self-reports are incorporated when interviewers make final ratings of cognition. The SCoRS was found to be a valid assessment of cognition, as global ratings were significantly correlated with composite scores of cognitive performance (Keefe, Poe, Walker, Kang, & Harvey, 2006). Ventura et al. (Ventura, Cienfuegos, Boxer, & Bilder, 2008; Ventura et al., 2010) developed similar scales incorporating informant reports, the Clinical Global Impression of Cognition in Schizophrenia (CGI-CogS) and subsequently the Cognitive Assessment Interview (CAI) from a subset of SCoRS and CGI-CogS items. Again, both were found to be valid assessments of cognition, though informant report added only incremental variance to patient interview-based ratings (Ventura et al., 2010).

To our knowledge, there is no scale that takes into account "first hand" ratings of informants in the evaluation of social cognitive deficits in schizophrenia. It is possible that individuals that interact with the individual with schizophrenia regularly in "real world" settings may provide a comprehensive and accurate view of their true social cognitive ability.

1.4. The present study: aims and hypotheses

The present study evaluated the psychometric characteristics of a new observer based rating scale of social cognition incorporating informant ratings, the Observable Social Cognition: A Rating Scale (OSCARS). First, this study evaluated the internal consistency and the test-retest reliability of the OSCARS over an approximate one-week period. Second, the construct validity was investigated through an exploratory factor analysis of the OSCARS. Construct validity was also assessed with group comparisons and analyses of diagnostic sensitivity. Third, the convergent validity of the scale was examined via the relationship between the OSCARS and measures of emotion perception, ToM, attributional style and jumping to conclusions. Fourth, external validity was explored through investigating the relationship between the OSCARS and measures of social skill, social, and role functioning. And fifth, since SC tends to be moderately associated with general intelligence and basic cognition, it is expected that IQ and cognition will be moderately associated with ratings on the OSCARS, which will provide evidence of discriminant validity.

2. Methods

2.1. Participants

Sixty-three individuals aged 25-60 with schizophrenia spectrum disorders and without current substance use problems were recruited through a university-based outpatient clinic as well as mental health centers in the Durham/Chapel Hill/Raleigh area. In the interest of parsimony, individuals with schizophrenia spectrum disorders will be referred to as individuals with schizophrenia. All participants were maintained on regular psychiatric outpatient treatment and antipsychotic medication throughout the study. Individuals were participating in a study of social cognition and interaction training (SCIT), a 20-24 week, manual-based group intervention that targets dysfunctional SC processes (Penn et al., 2005; Roberts & Penn, 2009). Screening procedures involved administration of the Wechsler Abbreviated Scales for Intelligence (WASI; Whitmyre & Pishkin, 1958) to rule out any individuals with possible mental retardation (IQ < 70). Individuals diagnosed with a major nervous system disorder (e.g., seizure disorder) were also excluded from participation. Participants were required to endorse a mild or greater level of social impairment as determined by a subgroup of items from the Social Functioning Scale (SFS; Birchwood, Smith, Cochrane, Wetton, & Copestake, 1990).

Participants were randomly assigned to a treatment as usual (TAU) (n=30) or the SCIT treatment group (n=32). Four cohorts participated in the study, with a cohort comprising one SCIT group and one TAU group (totaling approximately 14-18 participants/cohort). Two therapists facilitated each SCIT group. Diagnoses were

assessed through review of participants' medical charts and confirmed with items from the psychotic disorders section of the Structured Clinical Interview for DSM-IV – Patient Edition (SCID-P; Werner, 2001). Symptomatology was assessed with the Positive and Negative Syndromes Scale (PANSS) (Kay, Fiszbein, & Opler, 1987). The OSCARS was administered to participants in both TAU and SCIT treatment groups.

Fifty English-speaking non-psychiatric controls aged 18-65 were recruited through flyers and craigslist.org postings that reported no history of mental illness and no first-degree relatives with a psychotic disorder, bipolar disorder, or autism. There were no statistically significant differences between patient and NPC groups in baseline demographic variables with the exception of participant education and IQ (Table 1). Education and IQ were later included as covariates.

[TABLE 1]

2.2. Development of OSCARS

2.2.1. OSCARS Item Generation

The OSCARS is an 8-item, interview-based assessment of social cognition in outpatients with schizophrenia. These items were developed by the study's principal investigators (Drs. Penn, Combs, and Roberts) to broadly assess the social cognitive domains of ToM, emotion perception, cognitive rigidity, jumping to conclusions, and attributional style. These areas were selected because they have shown consistent deficits in patients with schizophrenia. The initial pool included eleven items that were reviewed for validity and quality by five experts in the field of social cognition: Drs. Patrick Corrigan (Illinois Institute of Technology), Allen Fenigstein (Kenyon College), Daniel Freeman (Oxford University), Bill Horan (UCLA), and Kim Mueser (Dartmouth

University). Experts rated each item on a 1-5 scale, 1 (lowest level of validity) and 5 (greatest level of validity). Items that reached an average rating of 3 or above were retained. Three items were removed because they were not considered to be valid indicators of social cognition, but rather social skill, self-awareness, and insight.

Each OSCARS item is comprised of a question probing a specific social cognitive construct followed by general example behaviors that reflect impairment in that domain. Each item is scored on a 7-point likert-type scale, higher ratings indicated a greater degree of observed impairment. Anchor points were created for four levels (1,3,5,7), and captured the degree of impairment as reflected in the severity and/or by the frequency that the impairment is observed.

2.2.2. OSCARS Administration

The OSCARS can be administered one of two ways, first as a semi-structured interview, and second as an informant-based questionnaire. It takes approximately 15-20 minutes to administer and rate. The interviewer was blinded to treatment group. The informant was provided with a copy of the instrument and directly selected each rating on the 7-point scale, utilizing the anchors provided. Thus, informant ratings were based solely on that individual's report, specifically regarding their interaction with and knowledge of the individual. For a subset of subjects (n=39), complete administration of the OSCARS generated an additional interviewer rating. The interviewer rating is an integrated rating that considered the information provided by the informant and permitted the interviewer to agree or disagree with the informant's rating.

Regarding informant selection, we aimed to interview the person who had the most regular contact with the patient in everyday situations. In this study, patient

informants held a variety of roles: first-degree family members (n=29), friends (n=8), significant others (n=6), roommates (n=4), other family members (n=3), social workers (n=3), clubhouse staff (n=3), therapists (n=2), supervisors (n=2), pastor (n=1), and job counselor (n=1) (n=62 total). Healthy control informants held the following roles: first-degree family members (n=10), friends (n=13), significant others (n=23), roommates (n=3), and other family members (n=1) (n=50 total).

2.3. Social cognitive measures

2.3.1. Emotion Perception

The Face Emotion Discrimination Task (FEDT) and the Face Emotion Identification Task (FEIT) were used to measure emotion perception (Kerr & Neale, 1993). The FEDT is comprised of 30-paired faces, instructing the participant to judge whether the two faces are displaying the same or different emotions. The FEIT contains 19 photographs depicting six basic emotions (happy, sad, afraid, angry, surprised, and ashamed). Emotion perception performance is indexed as the total number of correct items on both tasks. The protocol was later supplemented with the Penn Emotion Recognition Test (ER40; Kohler et al., 2003). The ER40 contains 40 photographs depicting six emotions (happy, sad, anger, fear, disgust, and neutral). Performance is indexed as the total number of correct items.

2.3.2. Theory of Mind

Both the Hinting Task (Corcoran, 2003) and The Awareness of Social Inference Test (TASIT; McDonald, Flanagan, Rollins, & Kinch, 2003) were used to measure ToM. The hinting task comprises ten short stories depicting an interaction between two characters, one of which makes an allusion at the end of the story. The participant is

instructed to infer what the character is implying by their allusion. Performance is indexed as the number of correct items. Part 2 of the TASIT (Social Inference—Minimal) was administered, which is comprised of a series of 15-videotaped interpersonal interactions lasting 20-60s each. Five of these segments involve straightforward verbal exchanges that match the situational context and social cues of the actors. Ten segments involve sarcastic verbal exchanges where the actor means the opposite of what they are saying. After each videotape, participants are asked to draw conclusions about (A) the intentions of the "target" actor, (B) if the "target" actor wants to convey the literal or non-literal meaning of their message, (C) the "target" actor's understanding of the situation, and (D) what the "target" actor is feeling. The total number of items correct indexes performance.

2.3.3. Attributional Style

The Ambiguous Intentions Hostility Questionnaire (AIHQ; Combs, Penn, Wicher, & Waldheter, 2007) was used to measure attributional style. It consists of 5 short vignettes that reflect situations that are ambiguous in intentionality. Participants are instructed to imagine the vignette is actually happening to them (e.g., "You walk past a bunch of teenagers at a mall and you hear them start to laugh") and verbally respond why the other person acted that way towards them. The participant rates whether that individual acted that way on purpose (definitely no [1], definitely yes [5]), how angry it would make them feel (not at all angry [1], very angry [5]), and how much they would blame the other person (not at all [1], very much [5]). Lastly, the participant is asked to write down how they would react to the situation. Two raters later independently coded participants' verbal responses involving why the person acted that way towards them to

compute an "AIHQ hostility bias" and how they would react to compute an "AIHQ aggression index." Raters were blind to condition and assessment number, using a five-point Likert-type scale ranging from not at all hostile (1) to very hostile (5). The three participant rated items of intentionality, blame, and anger were summed to create an "AIHQ blame index."

2.3.4. Probabilistic Reasoning (Jumping To Conclusions)

The "beads in the jar" task (Dudley, John, Young, & Over, 1997a; Dudley, John, Young, & Over, 1997b) was used to assess JTC. This computerized task consists of images of two jars with different proportions of red and blue beads, one with 60% blue beads and one with 60% red beads. The participant is told that the computer will randomly select beads from a jar and the participant's job is to decide from which jar the beads are being selected. The number of beads selected before a decision is made indexes performance.

2.4. Functional Measures

2.4.1. Social Skill and Social Functioning

The Social Skills Performance Assessment (SSPA; Patterson, Moscona, McKibbin, Davidson, & Jeste, 2001) was used to assess social skill/social functioning. The SSPA comprises two 3-minute role-plays between the participant and research confederate that were videotaped for subsequent ratings. Scene one consists of an interaction where the participant plays the role of a tenant getting to know a new neighbor. Independent raters coded participants' responses in scene one on the following categories: interest/disinterest, fluency, clarity, focus, affect, overall conversation, grooming, and social appropriateness. Scene two consists of an interaction where the

participant plays a tenant requesting their landlord fix a leak that has gone unrepaired with the objective of having the landlord fix the leak immediately. Raters coded participants' responses in scene two for: interest/disinterest, fluency, clarity, focus, affect, negotiation ability, submission/persistence, overall argument, and social appropriateness. Each category was rated on a scale of 1 to 5, lower ratings indicating greater social skill impairment. These categories produce additional indices of: "paralinguistic" skills composed of fluency and clarity summed scores; "participation, composed of interest and focus summed scores; "affect" and "social appropriateness" composed of individually rated items summed across role plays; and "SSPA Total" summed across all items in that scene.

The Global Social Functioning Scale (GSFS) was used to measure social functioning. This scale was partially derived from the Social and Occupational Functioning Assessment Scale from DSM-IV (SOFAS; APA, 2000) and the Global Assessment of Functioning (GAF) as it appears in the Scale of Prodromal Symptoms (SOPS; Miller et al., 2009). The item content was altered to focus specifically on social and interpersonal functioning. The Global Social Functioning Scale yields a single global social/interpersonal functioning score between 0 and 10, with lower scores indicating greater impairment. Trained research clinicians determined the score based on information from informant report.

The Role Functioning Scale (RFS; McPheeters, 1984), a 4-item semi-structured interview, measures four major domains of everyday functioning: working productivity, independent living/self care, immediate social network relationships, and extended social

network relationships. The RFS was conducted as an informant-based interview. Each item is rated on a scale of 1-7, higher ratings indicating greater functioning.

The Quality of Life Scale—Social (QLS-S) and Work (QLS-W) (Heinrichs, et al., 1984) comprises eight and four item subscales, respectively. Items are rated from a semi-structured interview regarding the participant's functioning over the past four weeks. Social or "Interpersonal Relations" items assess the participant's amount of social activity, capacity for intimacy, tendency towards withdrawal, and active versus passive participation. Work or "Instrumental Role" items assess the participant's functioning in work, school, and housework roles. Items are rated on a seven point Likert-type scale (0-6), with lower ratings indicating greater impairment. The QLS-S ranges from 0 to 48 and the QLS-W from 0-24.

2.4.3. Intelligence Quotient

The Wechsler Abbreviated Scales for Intelligence (WASI) was used to measure IQ, which consisted of administration of Matrix Reasoning and Vocabulary subtests.

2.4.4. Cognition

The informant-based Schizophrenia Cognition Rating Scale (SCoRS) was used to measure cognition, consisting of items assessing attention, memory, reasoning and problem solving, working memory language production, and motor skills (Keefe et al., 2006). Global ratings were derived from three different ratings: informant interview, interview with the patient, and interviewer impressions. The interviewer global rating was utilized because it has the highest correlation with indices of functioning (Keefe et al., 2006). Each global rating is coded on a scale of 1-10, higher ratings indicating greater cognitive impairment.

2.4.5. Symptoms

The Positive and Negative Syndrome Scale (PANSS) was used to assess symptomatology, which consisted of: negative scale, positive scale, general psychopathology scale, and total scale scores. Higher scores are associated with more severe symptoms.

2.5. *Procedure*

Advanced doctoral students in the clinical psychology program at the University of North Carolina conducted SCIT treatment sessions. Study protocol was administered under the supervision of the principal investigator (DLP). All research assistants completed comprehensive training on administration of study measures prior to working with participants. Raters were required to achieve acceptable levels of inter-rater reliability (ICCs and Kappas > .80) on all interview-based measures.

Participants with social functioning deficits were referred to the study by treatment staff knowledgeable about their presenting problems and psychiatric history. Following a telephone-screening interview, participants completed the baseline measures and were then randomized to treatment condition. The OSCARS was administered at baseline and then again 7-10 days later to evaluate test-retest reliability (mean=9.36, SD=3.04). The same informant was interviewed at both baseline and retest for all subjects with complete retest data (n=47).

3. Results

Data analyses were performed using SPSS version 16.0 and SAS version 9.1x system for Windows. Statistical significance will be defined as $p<.05$. Prior to all analyses, correlational analyses between interviewer and OSCARS informant ratings were computed. Interviewer and informant ratings were significantly correlated (r=.95), thus informant ratings will be used for subsequent analyses.

3.1. Reliability Analyses

The internal consistency of the OSCARS (Cronbach's alpha) was .80 in patients and .78 in controls. Test-retest reliability of the eight OSCARS items ranged from .50 to .70 (mean=.62, SD=.07). OSCARS total score test-retest reliability was .86 (n=47) (participants with schizophrenia only).

3.2. Validity Analyses

The construct validity of the OSCARS was evaluated via correlational analyses followed by a factor analysis in patients (n=62) and controls (n=50). All subsequent analyses were conducted separately, as evidence suggests the factor structure of social cognition differs between patients and controls (Eack et al., 2009). Table 3 presents the inter-correlations among the 8 OSCARS items in patients and controls. An exploratory factor analysis (EFA) examined whether the OSCARS loads on separable factors. An EFA was used because there have been inconsistent findings concerning factor loadings of social cognitive domains (Mancuso, Horan, Kern, & Green, 2011). The factor structure was determined by a preliminary examination of a scree plot and further

investigated with a chi-square test and model fit indices. Maximum likelihood extraction method was used because it generally provides better estimates than other approaches (Fabrigar et al., 1999). Crawford-Ferguson Quartimax, oblique rotation was selected because the factors are likely inter-correlated and not orthogonal.

In participants with schizophrenia, a two-factor solution was the model of best fit. The root mean square error of approximation (RMSEA) was within the range of reasonable fit at .07 (CI: .00-.15) (Brown and Cudeck, 1992). The Tucker-Lewis Index (TLI) was also adequate at .93 (Hu and Bentler, 1999). There was consensus between the scree plot and model fit for the selection of a two-factor model. Items were assigned to one factor depending on the magnitude of each factor loading (Table 4). The first factor contained high loadings for questions probing attributional style (2), jumping to conclusions (3), and cognitive rigidity (4,5). Factor 1 was labeled "social cognitive reasoning," as it appears to assess the social cognitive behavioral indicators of impulsivity, hostility, and rigidity. The second factor contained high loadings for questions probing theory of mind (6,7,8) and emotion perception (1). Factor 2 was labeled "social cue detection," as items share content involving interpretation of subtler manifestations of social cognition, e.g. emotional faces.

Factor scores were computed by summing OSCARS raw item scores that correspond to each factor. The factors were moderately inter-correlated with one another (Table 5). It should be noted that test-retest reliability was .87 for factor 1 and .85 for factor 2.

In controls, a three-factor solution was determined to be the model of best fit. The root mean square error of approximation (RMSEA) was within the range of close fit at

.04 (CI: .00-.19) (Browne and Cudeck, 1992). The Tucker-Lewis Index (TLI) indicates excellent model fit at .98 (Hu and Bentler, 1999). There was consensus between the scree plot and model fit for the selection of a three-factor model. The first factor contained high loadings for questions probing attributional style (2), jumping to conclusions (3), and cognitive rigidity (5). Factor 1 was labeled "social cognitive reasoning," as items assess social cognitive behavioral indicators of impulsivity, hostility, and rigidity. The second factor contained high loadings for questions probing emotion perception (1) and theory of mind (7, 8). Factor 2 was labeled "social cue detection," as items share content involving interpretation of subtler manifestations of social cognition, e.g. emotional faces and understanding others' perspectives. The third factor contained high loadings for questions probing cognitive rigidity (4) and theory of mind (6). Factor 3 was labeled "social cognitive flexibility" as items assess flexibility in social situations and subtle theory of mind ability. Factors 1 and 2 in healthy controls are very similar to factors 1 and 2 in individuals with schizophrenia. Factor scores were computed by summing OSCARS raw item scores that correspond to each factor. The factors were moderately inter-correlated with one another (Table 5).

Construct validity was also evaluated through investigating whether outpatients with schizophrenia would show impairment in the OSCARS relative to the NPC group. Chi-square tests and ANOVA were used to examine group differences on demographic variables. Participant education and WASI IQ score were significantly different between groups and thus were included as covariates in an ANCOVA. Individuals with schizophrenia had significantly greater deficits on the OSCARS than NPCs ($F(1,108)$, $p=.000$; table 2).

To assess diagnostic sensitivity, we conducted receiver operating characteristic (ROC) analyses to evaluate the potential for the OSCARS to be used as a diagnostic tool. A value of 1.0 indicates perfect diagnostic prediction and .50 indicates a level of chance. ROC analyses on OSCARS total scores indicated a high area under the curve (AUC) estimate of .85 (95% confidence interval [CI] = .78-.92; $p<.000$) in differentiating between individuals with schizophrenia and healthy controls (Figure 1). The optimal cut-off point suggested by the Youden Index was an OSCARS total score of 17 (sensitivity = .71, specificity = .78). Thus, anyone scoring higher than this cut-off may be considered scoring in the schizophrenia spectrum range, and anyone scoring below this cut-off can be considered scoring in the non-clinical range.

The convergent validity of the OSCARS was measured by computing a series of correlations between OSCARS total scores, factor scores, and measures of social cognition in patients and control samples separately (Table 6). In the schizophrenia sample, OSCARS total and social cue detection scores were significantly negatively associated with AIHQ aggression index scores, indicating that higher aggressive attribution ratings (i.e. increased tendency to report acting aggressively in ambiguous situations) are correlated with less impairment in social cognition.

In controls, OSCARS total was significantly correlated with TASIT total score, indicating greater theory of mind performance is associated with less impairment in real-world social cognition. Social Cognitive Reasoning (factor 1) was significantly correlated with AIHQ hostility bias; greater real-world social cognitive impairment was associated with greater hostile attribution biases to ambiguous situations. The correlations between

(1) hinting task and Social Cognitive Reasoning (factor 1) and (2) beads task and Social Cognitive Flexibility (factor 3) approached statistical significance.

External validity of the OSCARS was examined through computing a series of correlational analyses between OSCARS total and factor scores, and performance on indices of functional outcome in the schizophrenia sample (Table 7). OSCARS total and Social Cognitive Reasoning (factor 1) were significantly associated with GSFS scores such that less impairment in social cognition was associated with higher global social functioning. OSCARS total and Social Cue Detection (factor 2) were significantly correlated with SSPA scene 2 participation scores, indicating higher interest and focus during the role-play was associated with less impairment in social cognition. Several OSCARS indices were significantly correlated with RFS Working productivity and Independent Living subscales; greater productivity and independence were associated with less impairment in social cognition. OSCARS total and Social Cognitive Reasoning (factor 1) scores were significantly associated with role of functioning total scores; greater functionality was associated with lower deficits in social cognition. Additionally, several correlations approached statistical significance and were in the expected direction, including: OSCARS total/Social Cognitive Reasoning (Factor 1) scores and SSPA Role play 2 total score; Social Cognitive Reasoning (Factor 1) and RFS Extended Social network score; and OSCARS Total and QLS Work score.

Discriminant validity was explored through computing correlations between OSCARS total or factor scores and indices of neurocognition in the schizophrenia sample only. All OSCARS indices were significantly associated with the SCoRS, including OSCARS total ($r=.67$, $p<.000$), Social Cognitive Reasoning (factor 1) ($r=.54$, $p<.000$),

and Social Cue Perception (factor 2) (r=.57, p<.000). WASI Full Scale IQ was not significantly correlated with the OSCARS. The correlation between WASI and Social Cognitive Reasoning (factor 1) approached significance (r=-.23, p=.069). In other words, the OSCARS was correlated with an observational index of cognition, but not a standardized IQ test score. In addition, there were no significant correlations between OSCARS total or factor scores and PANSS subscales. The range of correlations was -.10 to .20.

3.3. Exploratory Analyses

Informant role in the patient group was split between first-degree family members (n=29) and other individuals (n=33), thus exploratory analyses were conducted to investigate potential differences in OSCARS ratings. First-degree family members rated participants as having significantly greater social cognitive deficits on the OSCARS than other informants (F(1,60), p=.008; first-degree family mean = 26.72, SD = 7.89; other individuals mean = 21.79, SD = 5.68). Similar analyses were not conducted in the control group because of uneven sample size (first degree family members, n=10; other individuals, n=40).

4. Discussion

The results of the present study indicate that the OSCARS is a psychometrically reliable, easily administered, observer based measure of social cognition. The OSCARS had adequate test-retest reliability and internal consistency. Exploratory factor analyses yielded interpretable factors in both patient and healthy control data. The OSCARS displayed evidence of construct validity, as OSCARS total scores (a) were significantly different between groups in the expected direction and (b) adequately differentiated between patients and controls in ROC analyses. The OSCARS displayed weak evidence of convergent validity with measures of social cognition but did show an association with various functional outcome measures. Interpretation of findings and implications for OSCARS use will be discussed below.

The OSCARS did not show impressive convergent validity in patients with schizophrenia, as indicated by the low correlations between OSCARS indices and measures of social cognition; it was not significantly associated with any measures of social cognition in the expected direction. This may be partially related to the questionable psychometric properties of current social cognitive measures used in schizophrenia research (Green et al., 2008). However, social cue detection (factor 2) was significantly negatively correlated with the AIHQ Aggression Index, indicating individuals with less social cognitive impairment report more aggressive responses to hypothetical ambiguous situations. Correlations between the OSCARS and AIHQ Hostility Bias were non-significant, suggesting that aggressive reactions were not

preceded by hostile biases. This is contrary to foundational work on attributional biases in aggressive boys, which posits aggressive behaviors occur as a result of systematic hostile biases (Dodge, 2006). However, individuals with serious mental illness are often targets of stigma, thus participants with higher social cognition may expect social situations to be more stigmatizing, and respond to them in a more reactive/automatic manner.

In healthy controls, the OSCARS yielded a 3-factor, rather than the 2-factor solution in the schizophrenia sample. This is consistent with findings on emotion intelligence, which showed a 4-factor model in healthy controls and a 2-factor model in people with schizophrenia (Eack et al. 2009). This suggests that there might be qualitative differences in social cognitive ability in controls and individuals with schizophrenia. The extent to which individuals with schizophrenia experience generalized versus specific social cognitive deficits is not well understood, however this might contribute to the present sample's differential factor analytic structures. Generalized deficits have been implicated in basic neurocognition, and likely result in a simpler factor structure (Dickinson and Harvey, 2009). Healthy controls may have differentiated social cognitive abilities, creating more variance, and hence, a greater number of factors..

The OSCARS total and factor scores in controls were significantly associated with indices of ToM and attributional style, and approached statistical significance with jumping to conclusions. All significant correlations in were in the expected direction, with the most consistent associations being between the OSCARS and TASIT, a performance based ToM task. Overall, however, the significant number of correlations with social cognitive measures was not impressive, consistent with the findings from the schizophrenia sample.

The OSCARS showed preliminary evidence of external validity, as it was significantly, albeit modestly correlated with indices of functioning, particularly: global social functioning, working productivity, independent living, functionality total, and approached statistical significance with QLS-Work. However, the OSCARS was not significantly correlated with SSPA (role-play) indices, with the exception of the participation score (role play 2). Thus, the present data suggest that the OSCARS is more consistently associated with critical functional abilities—the ability to perform basic self-care (e.g. cooking, cleaning, laundry), and to work and sustain employment, than abilities that manifest during social interactions. It is possible the OSCARS functions as more of a social capacity scale, whereby the scores indicate the level of social cognition an individual is capable of in an ideal situation, e.g. with an individual (informant) they see regularly and are comfortable with (Patterson and Mausbach, 2010). However, social capacity may not readily generalize to social functioning in the outside world or in a social role-play, including strangers.

Discriminant validity was assessed through correlations between OSCARS and neurocognition, though some work suggests there is a moderate relationship between these dimensions (Fett et al., 2011). Though correlations with standardized IQ (WASI) merely approached statistical significance, all OSCARS indices were significantly correlated with the observer based SCoRS. Higher correlations between OSCARS and SCoRS may be related to method variance, as the same informant provided information to the same interviewer/rater. However, if correlations are not fully accounted for by method variance, the OSCARS may be measuring facets of core functioning (work,

global social, independent living) in a way that is largely separable from social skill, social cognition, and objective measures of neurocognition.

Exploratory analyses were conducted to assess the nature of the relationship between informant role (first-degree family members versus other individuals) and OSCARS rating. Comparisons of these two groups indicated that first-degree family members rated individuals with schizophrenia as having higher levels of social cognitive impairment. It is unclear if this difference between groups is as a result of error variance or true variance between the groups. Potential error-related reasons for this difference may be related to (1) first-degree family members' possible difficulty forming accurate ratings due to their own social cognitive difficulties (Janssen et al., 2003), or (2) Error related to frustration with the family member (Schultz et al., 2013). A true variance related reason might be related to first-degree family's increased frequency of contact with the individual, and thus able to better speak to the individual's deficits. Further study is required to clarify this relationship.

The primary weakness of the methodology of this study was that the same informant provided collateral information used to score the GSFS, RFS, SCoRS, and OSCARS ratings. Thus, significant correlations may be partially due to common method variance, which measures systematic error. However, method variance does not account for OSCARS relationships with non-observer based scales, such as SSPA 2 participation and near significant correlations with SSPA 2 total, QLS Work, and WASI. Additionally, the RFS collects information on both social and non-social content (e.g. work and independent living), which decreases the likelihood that correlations are due to content similarity. Utilizing different informants across observer based measures would eliminate

the possibility that method variance is responsible for significant relationships. Further, requiring different interviewers to gather collateral across informant-based scales would prevent potential contamination across scales of rating information. Future research would benefit from addressing these issues.

In summary, this is the first known study to utilize informant report in the assessment of social cognition in individuals with schizophrenia. The OSCARS could provide supplemental collateral information beyond a battery of laboratory-based measures of social cognition. OSCARS administration is relatively brief (15-20 minutes) and appears to evidence external validity, though this may be due to shared method variance. Further research is needed to better understand the OSCARS' relationships with real world functioning. However, the present study provides preliminary evidence that the OSCARS may be useful for clinicians in collecting data about patients' potential real-world social cognitive deficits, in turn increasing the degree to which these impairments are considered treatment targets.

Table 1. Demographic and clinical characteristics

	Schizophrenia (N=62)		Controls (N=50)		Test Statistics	
	n	*M* (SD)	n	*M* (SD)	t, X^2 (df)	*P* value
Age	62	39.58 (11.47)	50	39.86 (9.85)	t=.14 (110)	.89
Education						
Participant	62	12.26 (1.21)	50	13.40 (1.18)	t=5.02 (110)	.00
Mother	56	12.66 (2.37)	48	12.67 (1.92)	t=-.01 (102)	.99
Father	47	12.96 (2.65)	31	12.87 (1.59)	t=-.16 (76)	.87
WASI (IQ)	62	99.74 (15.28)	50	110.80 (15.00)	t=3.84 (110)	.00
Age of first Hospitalization	62	22.71 (7.89)				
Number of Hospitalizations	61	6.31 (6.65)				
PANSS Symptoms						
Positive	62	16.52 (4.74)				
Negative	62	14.97 (4.03)				
General	62	34.18 (7.47)				
Total	62	65.66 (13.10)				
Sex (% male)	66.13		66.00		X^2 =.00 (df=1)	1.00
Race/Ethnicity						
Caucasian (%)	64.52		68.00			
African American (%)	35.48		32.00		X^2 =.15 (df=1)	.84
Hispanic/Latino						
Hispanic (%)	5.00		2.00		X^2 =.70 (df=1)	.62

Table 2. Descriptive statistics for OSCARS, social cognitive measures, and functional outcome measures

	Schizophrenia			Controls			Test Statistics	
	n	Mean	SD	n	Mean	SD	t, (df)	*P* value
OSCARS Total	62	24.10	8.31	50	13.86	5.68	-7.42 (110)	.00
Emotion Perception								
FEDT	62	25.00	2.22	50	25.28	2.18	.67 (110)	.50
FEIT	62	12.23	2.66	50	13.94	2.24	3.63 (110)	.00
ER40	28	30.43	5.47	49	33.16	2.71	2.93 (75)	.00
Theory of Mind								
TASIT	62	47.35	7.16	50	53.78	5.12	5.34 (110)	.00
Hinting Task	62	14.81	3.01	50	16.90	2.61	3.89 (110)	.00
Attributional Style								
AIHQ Blame Index	62	41.45	13.39	50	36.60	10.84	-2.07 (110)	.04
AIHQ Hostility Bias	62	10.71	3.05	50	8.44	2.48	-4.25 (110)	.00
AIHQ Aggression Index	62	8.95	1.94	50	10.28	1.83	3.70 (110)	.00
Jumping to Conclusions								
Beads Task	62	8.06	5.29	50	8.60	4.88	.55 (110)	.58
Functioning								
GSFS	61	5.98	1.15	-	-	-	-	-
SSPA1: Paralinguistic	60	7.04	1.26	-	-	-	-	-
SSPA1: Participation	60	7.16	1.73	-	-	-	-	-
SSPA1: Appropriateness	60	3.61	1.21	-	-	-	-	-
SSPA1: Affect	60	2.99	.98	-	-	-	-	-
SSPA1: Overall Conversation	60	3.23	.79	-	-	-	-	-
SSPA1: Total	60	28.40	4.63					
SSPA2: Paralinguistic	60	7.28	1.44	-	-	-	-	-
SSPA2: Participation	60	8.14	1.72	-	-	-	-	-
SSPA2: Appropriateness	60	4.02	1.00	-	-	-	-	-
SSPA2: Affect	60	3.01	.92	-	-	-	-	-
SSPA2: Total	60	28.38	5.41					
RFS:Working productivity	61	4.61	1.61	-	-	-	-	-
RFS: Independent living	61	5.38	1.34	-	-	-	-	-
RFS: Immediate social	61	5.51	.98	-	-	-	-	-
RFS: Extended social	61	5.05	1.41	-	-	-	-	-
Role of functionality total	61	20.54	3.70	-	-	-	-	-
QLS-Social	62	25.04	8.96	-	-	-	-	-
QLS-Work	62	14.32	4.78	-	-	-	-	-
QLS: Total	62	39.36	11.59					
Neurocognition								
SCoRS	62	4.92	2.48	-	-	-	-	-

Notes: FEDT = Face Emotion Discrimination Task; FEIT = Face Emotion Identification Task; ER40 = Emotion Recognition; TASIT = The Awareness of Social Inference Test; AIHQ = Ambiguous Intentions Hostility Questionnaire; GSFS = Global Social Functioning Scale; SSPA = Social Skills Performance Assessment (1/2 denote role play number); RFS = Role Functioning Scale; QLS = Quality of Life Scale; SCoRS = Social Cognition Rating Scale

Table 3. Inter-correlation among OSCARS items

Schizophrenia	Q1-EP	Q2-AS	Q3-JTC	Q4-CR	Q5-CR	Q6-ToM	Q7-ToM/Emp	Q8-ToM
Q1-EP	1							
Q2-AS	.23	1						
Q3-JTC	.26*	.56**	1					
Q4-CR	.30*	.58**	.61**	1				
Q5-CR	.30*	.29*	.37**	.53**	1			
Q6-ToM	.36**	.19	.23	.24	.20	1		
Q7-ToM/Emp	.44**	.29*	.36**	.18	.33**	.16	1	
Q8-ToM	.42**	-.13	.04	.03	.37**	.21	.46**	1
Controls								
Q1-EP	1							
Q2-AS	-.05	1						
Q3-JTC	.14	.48**	1					
Q4-CR	.24	.42**	.55**	1				
Q5-CR	.26	.07	.52**	.21	1			
Q6-ToM	.34*	.08	.24	.56**	.33*	1		
Q7-ToM/Emp	.45**	.15	.35*	.51**	.21	.42**	1	
Q8-ToM	.40**	.23	.37**	.40**	.32*	.25	.38**	1

Notes: EP = Emotion Perception; AS = Attributional Style; JTC = Jumping to Conclusions; CR = Cognitive Rigidity; ToM = Theory of Mind; Emp = Empathy.
*p<0.05; **p<0.01.

Table 4. Factor analysis of the OSCARS

	Factor 1: Social Cognitive Reasoning	Factor 2: Social Cue Detection
	Schizophrenia	
Q1-EP	.33	**.43**
Q2-AS	**.75**	-.16
Q3-JTC	**.75**	.01
Q4-CR	**.82**	-.01
Q5-CR	**.50**	.36
Q6-ToM	.28	**.21**
Q7-ToM/EMP	.32	**.47**
Q8-ToM	-.08	**.97**

	Factor 1 Social Cognitive Reasoning	Factor 2 Social Cue Detection	Factor 3 Social Cognitive Flexibility
	Controls		
Q1-EP	-.01	**.75**	.03
Q2-AS	**.37**	-.26	.30
Q3-JTC	**.98**	-.03	.05
Q4-CR	.05	.00	**.98**
Q5-CR	**.55**	.34	-.17
Q6-ToM	-.08	.35	**.51**
Q7-ToM/Emp	.10	**.43**	.34
Q8-ToM	.21	**.37**	.18

Notes: EP = Emotion Perception; Att = Attributional Style; JTC = Jumping to Conclusions; CR = Cognitive Rigidity; ToM = Theory of Mind; EMP = Empathy.
*p<0.05; **p<0.01.

Table 5. Correlations between OSCARS total informant score and OSCARS factors: schizophrenia and control sample

	OSCARS Total	Factor 1: Social Cognitive Reasoning	Factor 2: Social Cue Detection	Factor 3 Social Cognitive Flexibility
OSCARS Total	1	.76**	85**	77**
Factor 1: Social Cognitive Reasoning	.85**	1	.41**	.46**
Factor 2: Social Cue Detection	.80**	.36**	1	.52**
Factor 3 Social Cognitive Flexibility	-	-	-	1

Correlations to the left of the diagonal are Schizophrenia sample, shaded cells to the right of the diagonal are Control sample.
*p<0.05; **p<0.01.

Table 6. Convergent validity: correlations between OSCARS total informant score and OSCARS factor scores with measures of social cognition (n=62)

	OSCARS Total	Factor 1: Social Cognitive Reasoning	Factor 2: Social Cue Detection	OSCARS Total	Factor 1 Social Cognitive Reasoning	Factor 2 Social Cue Detection	Factor 3 Social Cognitive Flexibility
		Schizophrenia			**Controls**		
Emotion Perception							
FEDT	-.02	-.11	.09	-.17	-.21	-.12	-.08
FEIT	-.02	-.04	.01	-.03	-.08	-.06	.13
ER40	.00	.16	-.20	.03	.08	.12	-.20
Theory of Mind							
TASIT	-.14	-.13	-.10	**-.40****	**-.39****	-.24#	**-.37****
Hinting Task	.07	-.03	.15	-.22	-.28#	-.15	-.07
Attributional Style							
AIHQ Blame Index	.08	.10	.03	.00	.13	-.15	.07
AIHQ Hostility Bias	.11	.03	.16	.12	**.34***	-.15	.20
AIHQ Aggression Index	-.24#	-.14	**-.27***	-.12	.05	-.21	-.08
Jumping to Conclusions							
Beads Task	-.12	-.08	-.08	-.23	-.15	-.17	-.27#

Notes: FEDT = Face Emotion Discrimination Task; FEIT = Face Emotion Identification Task; ER40 = Emotion Recognition; TASIT = The Awareness of Social Inference Test; AIHQ = Ambiguous Intentions Hostility Questionnaire. **p*<0.05; ***p*<0.01; #*p*<.09

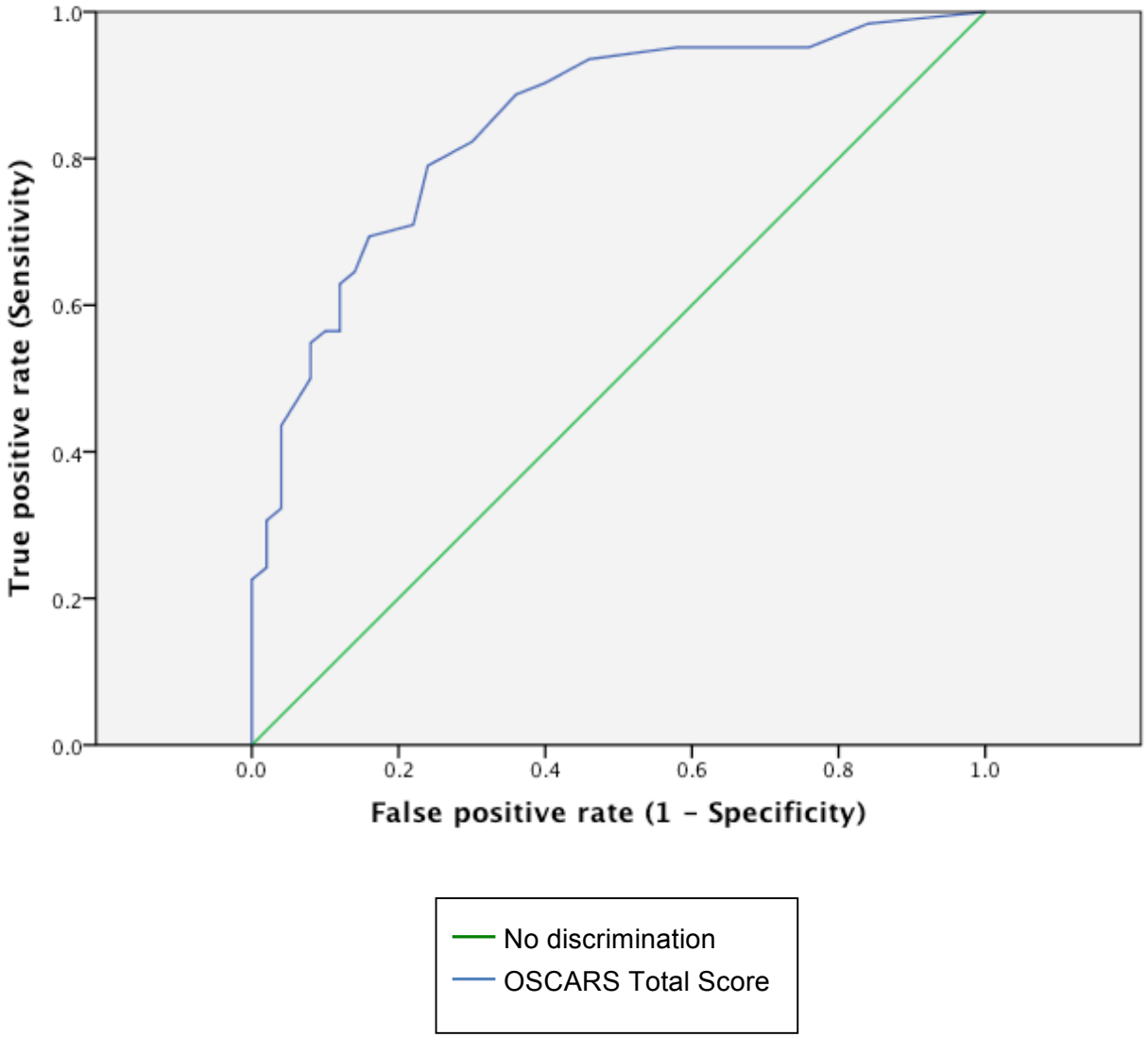
Table 7. Schizophrenia participants' external validity: correlations between OSCARS total informant score or OSCARS factor scores and measures of functional outcome

	OSCARS Total	Factor 1 Social Cognitive Reasoning	Factor 2 Social Cue Detection
GSFS	**-.27***	**-.30***	-.13
SSPA1: Paralinguistic	.00	.02	-.01
SSPA1: Participation	-.11	-.16	-.01
SSPA1: Appropriateness	.00	-.02	.02
SSPA1: Affect	-.06	-.12	.03
SSPA1: Overall Conversation	-.17	-.16	-.11
SSPA1: Total	-.07	-.09	-.03
SSPA2: Paralinguistic	-.16	-.14	-.12
SSPA2: Participation	**-.28***	-.20	**-.26***
SSPA2: Appropriateness	-.06	-.15	.06
SSPA2: Affect	.00	-.10	.13
SSPA2: Total	-.25#	-.23#	-.18
RFS: Working productivity	**-.39****	**-.34****	**-.29***
RFS: Independent living	**-.28***	**-.27***	-.20
RFS: Immediate social	-.13	-.16	-.06
RFS: Extended social	-.21	-.24#	-.09
Role of functionality total	**-.38****	**-.38****	-.25#
QLS: Social	-.02	-.11	.10
QLS: Work	-.24#	-.20	-.20
QLS: Total	-.11	-.17	-.01

GSFS = Global Social Functioning Scale; SSPA = Social Skills Performance Assessment (1/2 denote role play number); RFS = Role Functioning Scale; QLS = Quality of Life Scale

*p<0.05; **p<0.01; #p<.08.

Figure 1. Receiver operating characteristic curve for schizophrenia participants and controls



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