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Abstract

Background.—Impairments in social functioning are central to Schizophrenia (SCZ). Patients with SCZ have challenges in the ability to evaluate their functioning. A correlate of self-assessments in SCZ is depression, wherein negligible depression predicts overestimation. Healthy individuals misestimate their functioning, but mild dysthymia predicts accuracy. We examined depression, gender, and schizophrenia as predictors of self-reported everyday functioning.

Methods.—218 people with SCZ and 154 healthy controls self-reported their social functioning. They self-reported their depression with the Beck Depression Inventory (BDI) and their social cognitive ability on the Observable Social Cognition Rating Scale (OSCARS).

Results.—64% of subjects were male. Schizophrenia patients reported more depression, poorer social functioning, and worse social cognition. Linear regression analyses revealed significant

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correlations between self-reported social functioning and BDI scores, which also predicted self-reported social cognition. There was no significant effect of sex on self-reports of social functioning or social cognition. Finally, when BDI and OSCARS were directly compared to diagnosis and sex for prediction of self-reported social functioning, there was no impact of diagnosis or sex.

Implications.—Self-reported interpersonal functioning is determined by current depression. Both healthy people and people with schizophrenia index their social functioning and their social cognitive by their level of depression.

Introduction

The presence of schizophrenia (SCZ) is known to have implications for impaired social, functional, and cognitive functioning (Reichenberg and Harvey, 2009). Recent studies have focused on the effects of SCZ on a patient's ability to self-assess their functioning, finding that, on average, patients with schizophrenia report better overall functioning than is observed by reliable outside informants (Harvey and Pinkham, 2015). Compared to healthy controls, patients with schizophrenia have also been found to exhibit increased confidence in their responses to test items during perceptual (Moritz et al., 2015) and social cognitive (Moritz et al., 2012) assessments, even when incorrect in their choices (Jones et al., in press). Additionally, patients with SCZ have repeatedly been found to utilize less global information to inform complex decision making than healthy individuals (Moritz et al., 2014). These findings suggest that patients with SCZ exhibit impairments in self-monitoring and in updating current consciousness with newly acquired information, as well as challenges in being able to use this information to revise their self-assessments. Thereby, patients with schizophrenia consistently report higher levels of functioning compared to objective data, likely due to this failure to integrate and consider all available information.

Schizophrenia alone can impact self-assessments, but there are other factors which contribute these reports, including gender and presence of depressive symptoms. There are gender differences observed in the clinical course of schizophrenia, with illness onset occurring at a younger age for men than for women. Therefore, the illness begins at a less fully mature level of social and cognitive development in men compared to women (Hafner, 2003). As a result, women with SCZ have demonstrated higher scores on neuropsychological testing and greater social functioning (Vaskin et al., 2011), with premenopausal women in particular exhibiting significantly less global disability than men. In healthy controls, it has also been found that gender has effects on one's confidence. Women tend to report lower confidence in decisions and in their abilities than men, despite equal ability, particularly in fields where stereotypes are held that women are at a disadvantage (Haggital and Shaefer, 2006).

Gender is also implicated in depression, with more women reporting depressive symptoms than men and major depression being more common in females. When making self-assessments, healthy people, on average, are found to overestimate their abilities. However, there have been both gender and mood effects reported in studies of the accuracy of self-assessments. Females tend to manifest reduced confidence in decision-making compared to

males (Correll, 2001), and mild depressive symptoms seem to result in reduced levels of overestimation of abilities (Alloy and Abramson, 1979). Thus, naturally occurring depression at mild levels leads to the "sadder but wiser" phenomenon, in which mildly depressed people have a more accurate reflection of their functioning compared with other information than individuals who report no depression (Moore and Fresco, 2012). The effect is further demonstrated in healthy individuals who, after receiving deflating feedback about their abilities, correct their overestimations, resulting in more accurate self-report s(Kruger and Dunning, 1999). With moderate to severe depression, misestimation of abilities is also seen, but in the direction of underestimation (Harvey et al., 2015). This phenomenon has also been observed in patients with schizophrenia, in that those with no self-reported depressive symptoms are found to overestimate their overall abilities and functioning, while mild depressive symptoms are associated with self-assessments that more closely resembled that of reliable informants.

Misestimation of abilities in cognitive, social-cognitive, and everyday functioning domains has been found to predict disabilities in functioning above and beyond the variance associated with skill deficits (Gould et al., 2015; Silberstein et al., 2018). One explanation (Silberstein and Harvey, 2019) is that the misestimation is bidirectional: when patients overestimate their abilities, they may attempt tasks that they are unable to complete. Over time, repeated failures may contribute to reduced motivation and poorer outcomes. Overconfidence in social cognitive judgments may also result in behavioral incidents where the patient may believe their perceptions of others to be correct without question. Therefore, they may misinterpret interactions both in overly negative (i.e., threatening) or overly positive (i.e., misperception of others' interest in them) directions. When patients underestimate their abilities, it can result in missed opportunities for which they could achieve functional gains and reduce their level of disability. Interestingly, levels of misestimation have been found to be normally distributed, with about 1/3 overestimating, 1/3 underestimating, and 1/3 congruent with others' opinions (Gould et al., 2015; Silberstein et al., 2018; Jones et al., in press).

Diagnosable depression is common in schizophrenia, with at least 30% of patients exhibiting a major depressive episode in their lifetime (Harvey et al., 2015). Naturalistic observational research of people with schizophrenia demonstrates that the average level of depression is mild to moderate at the time self-reports are collected (Ermel et al., 2017; Harvey et al., 2017). Therefore, it is important to understand how these symptoms affect self-assessment. As noted above, current depressed mood (not necessarily occurring in the context of diagnosable major depression) has been found to be correlated to self-assessment patterns in patients with schizophrenia (Ermel et al., 2017). However, also noted above, there are overall gender effects on prevalence of mood symptoms, general patterns of self-assessment, and in functional outcomes in schizophrenia. In this study, using a large sample of people with schizophrenia and healthy controls, we examine the effects of diagnosis of SCZ, gender, and current depressed mood on self-reported social functioning and self-reported abilities in the social cognitive domain.

In this report we evaluate whether depressed mood in schizophrenia is more severe in females than in males, and we also determine whether males, regardless of diagnosis,

evaluate themselves as more capable and higher functioning than females. In so doing, we will evaluate whether possible gender effects on self-assessment functioning are driven by the more common presence of mild depressive symptoms in females. Finally, we test the alternative hypothesis that mood has the same influence on self-assessment in men and women with schizophrenia and see whether healthy and SCZ female patients have a stronger correlation between their self-reported everyday functioning and self-reported depression than males. Our hypotheses were that:

1.   Depression would be of greater severity in females than in males, across diagnoses.

2.   Depression would correlate with self-reported functioning in both diagnostic groups.

3.   The correlations between depression and self-reports of functioning would be greater in the SCZ sample.

Methods

Participants

Data was collected during the final phase of the Social Cognition Psychometric Evaluation Study (SCOPE) from three sites: The University of Miami Miller School of Medicine (UM), The University of North Carolina at Chapel Hill (UNC), and The University of Texas at Dallas (UTD). 372 participants were enrolled in this study, including 218 stable outpatients diagnosed with either schizophrenia or schizoaffective disorder and 154 healthy controls. UM patients were recruited from the Jackson Memorial Hospital-University of Miami Medical Center and the Miami VA Medical Center. UNC patients were recruited from the Schizophrenia Treatment and Evaluation Program (STEP) in Carrboro, NC and from the Clinical Research Unit (CRU) in Raleigh, NC. UTD patients were recruited from Metrocare Services, a non-profit mental health services organization in Dallas County, TX, and from other local clinics. The study was approved by the local IRB at each of the sites.

The methods for recruitment, assessment, diagnosis, and exclusion criteria have been previously published (Pinkham, et al. 2018). Patient participants were required to have DSM-IV diagnoses of schizophrenia or schizoaffective disorder and to have a stable medication regimen for at least six weeks, without any changes for at least two weeks. Diagnosis of schizophrenia or schizoaffective disorder was confirmed by clinical interview, using the Structured Clinical interview for the DSM (SCID; First et al., 2002) Psychosis and Substance Abuse modules and the Mini-International Neuropsychiatric Inventory (MINI; Sheehan et al., 1998). Healthy controls were recruited via advertisements, and they were screened with the same assessments as the patients to ensure the absence of psychopathology. All participants provided signed informed consent.

Exclusion Criteria

For both patients and healthy controls, exclusion criteria included: (1) history of or current medical or neurological disorders that may affect brain functioning (e.g., CNS tumors, seizures, or loss of consciousness for over 15 minutes), (2) history of or current intellectual

disability (IQ<70) or pervasive developmental disorder according to the DSM-IV criteria, (3) substance abuse within the past month, excluding caffeine and nicotine, (4) substance dependence not in remission for at least six months, (5) visual or hearing impairments that interfere with assessment, and (6) lack of proficiency in English. Patients were also excluded if they had been hospitalized within the past two months.

Assessments

Self-reported Depression: All study participants completed the Beck Depression Inventory, second edition (BDI-2, Beck et al., 1996). This self-reported instrument has scores that can range from 0–3 across 21 items, leading to total score of 0–63. Higher scores indicate greater severity of depression.

Self-reported Social Cognitive Ability: All study participants completed the Observable Social Cognition Rating Scale (OSCARS; Healey et al., 2015), which contains 8 items to assess social cognition. Each item includes a question investigating a social cognitive domain (attributional style, emotional perception, jumping to conclusions, theory of mind, and cognitive rigidity), followed by example behaviors that reflect impairment in that domain. Participants rated their abilities for each question. An additional question investigated the participants' impression of their global social cognitive abilities, using a 10-point scale, with higher scores again reflecting greater impairment. The 10-point global rating was used as the outcome measure in our study. The internal consistency of the OSCARS was found to be 0.8 in patients, with test-retest reliability of the items ranging from 0.5 to 0.7 (Healey et al., 2015). A subsequent study from this database examined the correlation between OSCARS total scores and global ratings for patients was $r = 0.67$ ($p<0.001$; Silberstein et al, 2018).

Self-reported Everyday Social Functioning: All study participants completed the 31-item Specific Levels of Functioning Scale (SLOF; Schneider and Struening, 1983) to assess self-reported everyday social functioning. Items are rated on a Likert scale from 1–5 and are then averaged to produce a total score. Higher scores indicate better functioning. For this study, we focused on self-reported social functioning, because we were also examining self-reported social cognitive ability. Further, our previous analyses of this dataset have suggested that social functioning is more strongly linked to social cognition and mood symptoms than other elements of functioning (Harvey et al., 2019). The SLOF also assesses real-world vocational functioning and everyday activities.

Data Analyses—We compared group means for both patients with schizophrenia and healthy controls on self-reported depression, self-reported social cognitive ability, and self-reported everyday social functioning. These three variables were compared across the groups with t-tests. The data was then analyzed using stepwise entry linear regression models to quantify the predictors of self-reported everyday interpersonal functioning using gender, diagnosis of schizophrenia, and level of self-reported depression. A final set of stepwise regression analyses examined the predictors of self-reported social cognitive ability.

Results

Demographic information for the study sample is included in supplemental table 1 because it was previously published. Sixty-five percent of schizophrenia participants were male, as were 63% of the healthy controls. There were no significant differences in any major demographic variables between the two samples. The means and standard deviations for self-reports of all variables of interest: level of depression indexed by the BDI, social cognition indexed by the OSCARS, and everyday social functioning using the SLOF are included in Table 1. Patients with schizophrenia reported significantly higher levels of depression, $p<.001$, poorer social cognitive ability, $p<.001$, and poorer overall everyday social functioning, $p<.001$. Females reported more depression, $p<.001$ and poorer social cognitive ability, $p=.012$, than males. The sex difference in self-reported social functioning did not approach significance, $p=0.98$, with identical mean scores.

The intercorrelations, calculated with Pearson Product Moment correlations, between BDI scores, OSCARS scores, and SLOF functioning are presented in Table 2. Level of depression, social cognitive ability, and overall social functioning were significantly intercorrelated. In both SCZ and HC groups, lower levels of depression were associated with higher self-reported ratings of functioning. These correlations are presented within diagnostic group, both across sex and within sex, as well as across diagnostic groups, as shown in the table. The correlations were all quite similar to each other, with the exception of the outlying large correlation between self-reported depression and self-reported social cognitive ability in women. Because of this large correlation, we examined the data with a scatter plot to ensure that outlier had not excessively contributed. As presented in Supplemental Figure 1, the relationship did not appear to be driven by outliers.

We utilized stepwise linear regression analyses to determine which of the variables (level of depression, gender, psychiatric diagnosis) was the strongest predictor of self-reported everyday functioning. In these models, we used sex, diagnosis, and self-reported depression to predict self-reported social functioning in a stepwise regression model. The analysis was significant, $F(329)=97.04$, $p<.001$. $R^2 =. 23$. Only depression entered the predictive equation, $t(329)=9.90$, $p<.001$, while sex, $t=1.55$, $p=.12$, and diagnosis, $t=1.4$, $p=.17$, were both not significant predictors. We also calculated "sex x diagnosis" and "depression x diagnosis" interaction terms and added them to the original regression model. Neither of these interaction terms entered the equation: "sex x diagnosis," $t=1.58$, $p=.12$; "depression x diagnosis," $t=0.45$, $p=.66$. When we added OSCARS scores to the predictive equation, it was found to be a significant contributor, $t=2.91$, $p=.004$, and added an incremental 2% of the variance to the predictive equation.

Next we changed OSCARS scores to the dependent variable, attempting to predict self reports of social cognition using sex, diagnosis, depression, and their interactions. The regression equation was significant, $F(1,329)=175.32$, $p<.001$. The interaction of depression x sex entered the equation first, $t=13.24$, $p<.001$, accounting for 32% of the variance in OSCARS scores, while diagnosis entered the equation second, $t=4.87$, $p<.001$, accounting for an incremental 4% of the variance. Sex did not enter the equation, $t=.78$, $p=0.44$. The

origin of the interaction is likely because the correlations between depression and OSCARS scores were much higher in females than in males, as noted above.

In order to confirm the importance of depression, as compared to diagnosis or sex, for the prediction of both self-reported social functioning and self-reported social cognitive ability we performed two final analyses. For these two analyses, we used a forced entry hierarchical procedure. For each equation, we entered sex and diagnosis in the first block and BDI total scores in the second. The results of these analyses are presented in Table 3. For both equations, sex and diagnosis accounted for significant variance in the self-reported social outcomes variables. For self-reported real world social functionating, BDI scores accounted for 16 % of the variance above and beyond sex and diagnosis. For self-reported global social cognitive ability, BDI scores accounted for 14% of the variance above and beyond sex and diagnosis.

Discussion

The goal of our study was to determine the effects of sex, level of depression, and presence of schizophrenia on self-assessment social functioning. We found that the level of depressive symptoms predicted self-assessments of social functioning, both in terms of self-assessments of real-world social outcomes and social cognitive competence. Interestingly, correlations between depression and self-assessed social functioning were similar in both SCZ and HC groups, and nearly as similar for both males and females. The correlation between depression and self-assessment are evidenced at both low levels of depression severity (HC group) and at considerably higher levels of depression severity (SCZ group). Direct comparisons suggested that depression accounted for variance in self-assessments even when the influences of sex and diagnosis were accounted for. Therefore, the level of depressive symptoms was determined to be the most important variable in predicting a subject's level of self-reported functioning, with the effect of depression being much more substantial than the effects of gender or presence of SCZ.

There are some limitations of the study. HC had low levels of depression and a depressed comparison sample would be of interest. It is also not clear whether HC subjects with mild depressive symptoms are less socially capable, or they may just have the subjective experience that they are less socially capable. We were unable to assess the accuracy of the HC 's self-assessments; therefore, while higher levels of depression were linked to reports of poorer functioning, we cannot confirm that depression is associated with functioning that is objectively worse, except in the case of patients and independent living. Shared method variance may also have contributed to the correlational findings seen in this study.

Our results are consistent with previous studies which have demonstrated that a subject's level of depression affects self-assessment, in that both patients with SCZ and HC who do not have depressive symptoms have been reported tend to overestimate their functioning when compared to objective data and reports of knowledgeable informants. Our previous findings in this database reinforce this notion, demonstrating that patients with SCZ who do not have depressive symptoms substantially overestimate their level of functioning (Harvey et al., 2019). Previous studies have also found that in HC, the absence of depression was

associated with overestimation of functioning, compared to individuals with mild depression (Alloy and Abramson, 1977). This finding has been studied more in HC than in patients with SCZ, and based on previous studies, it appears to be stronger in females than in males. These gender differences may be due to gender differences observed in the clinical course of schizophrenia, gender differences seen in prevalence of depressive symptoms, or gender differences in overall confidence, particularly in areas where stereotypes exist that place females at a disadvantage. In two previous studies, we determined that depression in SCZ participants was more strongly associated with self-assessment of performance than actual performance in real-world functioning (Harvey et al., 2017; 2019). However, the association between self-reported competence and mild depression may health implications even in "generally healthy" people.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- Depression has been reported to be associated with self reports of skills and functioning in healthy people (HC) and people with schizophrenia SCZ

- Depression predicted self-reported social functioning and social cognition equivalently in HC and people with SCZ

- Depression predicted self reports of social functioning more substantially then diagnosis or sex

Table 1

Means and Standard Deviations for Self-Reported Depression, Social Cognitive Ability, and Everyday Social Functioning for Participants with Schizophrenia and Healthy Comparison

	Schizophrenia (n=218)		Healthy Comparison (n=154)				
	M	SD	M	SD	t	p	d
Beck Depression Inventory	15.1	12.5	5.6	5.6	8.64	.001	0.92
OSCARS: Global	4.5	2.5	2.2	1.5	10.17	.001	1.0
SLOF: Interpersonal	3.6	0.9	4.1	0.7	5.27	.001	0.63
	Females (n=133)		Males (n=239)				
	M	SD	M	SD	t	p	d
Beck Depression Inventory	13.7	12.8	9.8	10.0	3.31	.001	0.34
OSCARS Global	3.9	2.6	3.3	2.3	2.42	.016	0.24
SLOF: Interpersonal	3.8	0.9	3.8	0.8	0.27	0.98	0.00

OSCARS: Observable Social Cognition Rating Scale

SLOF: Specific Levels of Functioning

Table 2

Intercorrelations of Variables: Presented by Diagnosis and Sex

Schizophrenia Patients (n=218)

	BDI	OSCARS	SLOF Interpersonal
BDI	1.0	.47 ***	−.44 ***
OSCARS		1.0	−.37 ***

Healthy Controls (n=154)

	BDI	OSCARS	SLOF Interpersonal
BDI	1.0	.47 ***	−.55 ***
OSCARS		1.0	−.57 ***

Females (n=132)

	BDI	OSCARS	SLOF Interpersonal
BDI	1.0	.72 ***	−.44 ***
OSCARS		1.0	−.37 **

Males (n=239)

	BDI	O'CARS	SLOF Interpersonal
BDI	1.0	.44 ***	−.43 ***
OSCARS		1.0	−.40 ***

Note. BDI: Beck Depression Inventory

OSCARS: Observable Social Cognition Rating Scale

SLOF: Specific Levels of Functioning

***
p<.001;

**
p<.01

Table 3

Forced- Entry Regressions Predicting Self-reported Social Functioning and Social Cognitive Abililty

Regression predicting self-reported Everyday Social Functioning				
Block 1	t	p	$R^2_{increamental}$	R^2_{total}
Sex and Diagnosis	5.34	.001	.08	`.08
Block 2				
BDI Scores	8.20	.001	.16	.24
Regression predicting self-reported Global Social Cognitive Ability				
Block 1	t	p	$R^2_{increamental}$	R^2_{total}
Sex and Diagnosis	10.48	.001	.24	`.24
Block 2				
BDI Scores	8.72	.001	.14	.38