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Research Paper

Confidence, performance, and accuracy of self-assessment of social cognition: A comparison of schizophrenia patients and healthy controls

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ABSTRACT

Impairments in self-assessment in schizophrenia have been shown to have functional and clinical implications. Prior studies have suggested that overconfidence can be associated with poorer cognitive performance in people with schizophrenia, and that reduced awareness of performance may be associated with disability. However, overconfidence is common in healthy individuals as well. This study examines the correlations between performance on a social cognitive test, confidence in performance, effort allocated to the task, and correlates of confidence in patients with schizophrenia and healthy controls (HC). Measures included self-reports of depression, social cognitive ability, and social functioning. A performance-based emotion recognition test assessed social cognitive performance and provided the basis for confidence judgments. Although schizophrenia patients had reduced levels of overall confidence, there was a substantial subset of schizophrenic patients who manifested extreme overconfidence and these people had the poorest performance and reported the least depression. Further, a substantial number of HC over-estimated their performance as well. Patients with schizophrenia, in contrast to HC, did not adjust their effort to match task difficulty. Confidence was minimally related to task performance in patients but was associated with more rapid decisions in HC, across both correct and incorrect responses. Performance on social cognitive measures was minimally related to self-reports of social functioning in both samples. These data suggest global self-assessments are based on multiple factors, with confidence affecting self-assessments in the absence of feedback about performance.

1. Introduction

Research on cognition in schizophrenia has expanded from performance-based cognitive assessments to interview-based assessments of cognitive dysfunction and studies of self-assessments of cognitive abilities. Use of these relatively novel assessment methods has yielded valuable new insights into the nature of cognitive dysfunction in this population. For example, patients with schizophrenia are commonly found to have compromised episodic memory performance, however, studies of self-assessment have found that had higher confidence in their performance when errors were made (Moritz et al., 2006b). Similarly, researchers examining the relationship between cognitive insight and neurocognition in people with schizophrenia found that poor performance on verbal learning assessments explained significant amounts of variance in overconfidence in responses, suggesting that overconfidence can be associated with poorer cognitive performance (Engh et al., 2011). Metacognitive awareness of errors in performance and overconfidence in performance when errors are made can also be linked to symptoms of the illness such as delusions (Moritz et al., 2006b; Moritz et al., 2006a), in that patients with delusions and hallucinations commonly manifest overconfidence (Bora et al., 2007) and that patients with higher levels of paranoia show increasing overconfidence when answering questions they consider to be easy (Moritz et al., 2015a, 2015b).

In addition to these clinical implications, impairments in self-assessment in schizophrenia have also been shown to have functional

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implications. Pinkham et al. (2018a) found that greater confidence while performing social cognition tests, regardless of correctness of responses, was correlated with globally poorer everyday functioning. Gould et al. (2015) found that impairments in self-assessment of cognitive performance were more strongly correlated with impaired everyday functioning than was performance on neurocognitive tests. Silberstein et al. (2018) expanded this paradigm to examine self-assessment of social cognitive abilities, finding that impairments in self-assessment of social cognitive ability in schizophrenia patients accounted for more variance in social functioning than performance on social cognitive performance-based measures.

While the determinants of challenges in self-assessment in schizophrenia are unknown, evidence points to potential neural underpinnings and a modulatory role of mood state. The increased confidence when incorrect seen in patients with schizophrenia may be based in their difficulties with self-monitoring, which may be associated with certain positive symptoms (Gawęda et al., 2013; Moritz et al., 2015a, 2015b). Anatomical studies using neuroimaging have found that overconfidence in schizophrenia is related to hippocampal presubiculum atrophy, which is also implicates impairments in episodic memory (Orfei et al., 2017). This also suggests that overconfidence can be related to a difficulty in updating new information into memories and subsequently revising self-assessments (Orfei et al., 2017). Further, our own research has suggested that there are additional areas of cortical dysfunction detectable with fMRI, including clear differences in cortical activation associated with impairments in self-assessment of social cognitive performance between healthy people and people with schizophrenia (Pinkham et al., 2018b).

Mis-estimation of functioning is not solely a feature of psychiatric conditions. Healthy individuals commonly overestimate their abilities in many types of tasks (Kruger and Dunning, 1999), more when they are asked to generate global assessments of their abilities (Dunning et al., 2004) and less in moment to moment judgments of performance (Cornacchio et al., 2017). Mood states also appear to impact self-assessments in healthy people and clinical populations. For example, deflating feedback leads healthy people to re-adjust their self-assessments (Dunning et al., 2004) and the “sadder but wiser” effect (Alloy and Abramson, 1979) is associated with more accurate self-assessment in otherwise healthy people with mild dysthymic symptoms (Moore and Fresco, 2012).

Patients with bipolar depression were found to provide self-assessments of everyday functioning that were strongly related to their current levels of depression, with this correlation much larger for their self-reports than for clinician assessments of their functioning (Harvey et al., 2015). Patients with schizophrenia with very low levels of depression have been found to be much less accurate and realistic reporters of their everyday functioning (Harvey et al., 2017; Siu et al., 2015), consistent with findings in healthy people where deflating feedback leads to normalization of self-assessment but not to underestimation of abilities (Dunning et al., 2004).

In an effort to better understand the implications and correlates of impaired self-assessment in schizophrenia, the present study examines the correlations between performance on social cognitive tests, the level of confidence in performance on those tests, and the effort allocated to the task (indexed by the time spent solving problems),in patients with schizophrenia as compared to healthy controls. In a previous study, we examined a much smaller sample of healthy controls and patients with schizophrenia while they performed an emotion recognition task (Cornacchio et al., 2017). When participants were instructed to perform as rapidly as possible while sustaining accuracy and asked for confidence ratings immediately after each task item, we found that healthy controls adjusted their effort to the difficulty of the task items while schizophrenia patients did not. We also found that healthy controls were more confident when correct than schizophrenia patients. Importantly, we found that when we controlled for depression, diagnostic differences in confidence were eliminated, while this analysis did not affect the group differences in effort allocation.

The current study improves on the previous study in several ways. First, we have a much larger sample size. We also have self-reports of everyday social functioning, social cognitive ability, and depression in both healthy controls and patients. Thus, we are able to examine group differences in test performance, confidence and effort allocation, both when correct and incorrect, and the influences of mood states on confidence and performance on the social cognitive tests. Importantly, we can now determine whether performance-related confidence, as compared to more global states such as severity of depression, predicts self-assessment of everyday functioning in both schizophrenia and in healthy people.

It was our hypothesis that people with schizophrenia would be less likely than healthy people to adjust their efforts in response to their levels of confidence and to task difficulty. We also hypothesized that greater confidence, particularly when incorrect, and lower levels of depression would predict poorer performance on the part of people with schizophrenia. Finally, we also expected that performance on social cognitive tests would be less likely to be associated with judgments regarding social cognitive ability in schizophrenia patients compared to healthy controls, in line results above suggesting failures to consolidate performance information into judgments of ability.

2. Methods

2.1. Participants

Data collection occurred at three sites in this final phase of the Social Cognition Psychometric Evaluation study (SCOPE; Pinkham et al., 2018a): The University of Texas at Dallas (UTD), The University of Miami Miller School of Medicine (UM), and The University of North Carolina at Chapel Hill (UNC). Participants were stable outpatients with diagnoses of schizophrenia or schizoaffective disorder (n = 218) and healthy controls (n = 154). UTD patients were recruited from Metrocare Services, a non-profit mental health services provider organization in Dallas County, TX, and other area clinics. UM patient recruitment occurred at the Miami VA Medical Center and the Jackson Memorial Hospital-University of Miami Medical Center, and UNC patients were recruited from the Schizophrenia Treatment and Evaluation Program (STEP) in Carrboro, NC and the Clinical Research Unit (CRU) in Raleigh, NC.

All methods for diagnosis, assessment, recruitment, and exclusion were previously published (Pinkham et al., 2018a). Inclusion of patients was based on a DSM-IV diagnosis of schizophrenia or schizoaffective disorder confirmed by clinical interview using SCID Psychosis and Substance Abuse Modules (First et al., 2002) and the MINI International Neuropsychiatric Inventory (Sheehan et al., 1998). In addition, patients were required to be on a regular medication schedule for at least six weeks with no dose changes in the last two weeks. Health controls were recruited with advertisements and the same assessments were used to ensure the absence of psychopathology.

2.2. Exclusion criteria

Participants were excluded if they presented with: 1) current or past history of pervasive developmental disorder or intellectual disability by DSM-IV criteria (defined as IQ < 70), 2) current or past history of medical or neurological disorders that may affect brain function (e.g. seizures, CNS tumors, or loss of consciousness for 15 or more minutes), 3) sensory limitations including visual (e.g. blindness, glaucoma, vision uncorrectable to 20/40) or hearing impairments that would interfere with assessment, 4) lack of English proficiency, 5) history of substance abuse within the past month, excluding nicotine or caffeine, and 6) substance dependence that has not been in remission over the past six months. Furthermore, patients were excluded if they had been hospitalized in the past two months.

All participants provided signed informed consent and the project was approved at each site by the local IRB.

2.3. Assessments

2.3.1. Clinical symptom ratings

The Positive and Negative symptom scale, a 30-item scale, was used to rate the severity of positive and negative symptoms (Kay et al., 1987). These ratings were only completed for patients and, as no specific analyses were performed, they are included in the supplemental information for comparison purposes only.

2.3.2. Self-reported depression

Both patients and healthy controls completed the Beck Depression Inventory, second edition (BDI-2; Beck et al., 1996). This is a self-report measure of depression severity that ranges from 0 to 63. Previous research has suggested that self-reports on the BDI are correlated with clinician ratings of depression in people with schizophrenia and that BDI scores have a number of systematic correlates potentially validating these responses.

2.3.3. Self-reported social cognition

Both patients and healthy controls completed the Observable Social Cognition Rating Scale (OSCARS; Healey et al., 2015). The OSCARS assesses social cognition with 8-items. Each OSCARS item is structured with a question probing a social cognitive domain (attributional style, theory of mind, cognitive rigidity, jumping to conclusions, and emotional perception) followed by examples of general behaviors that reflect impairment in that domain. Participants ranked their abilities on items in each domain on a 7-point scale with greater impairment indicated by higher ratings. An additional global functioning item utilized a 10-point scale, again with higher ratings indicated greater impairment. The global rating was used as our outcome measure.

The OSCARS was previously validated in two comprehensive studies. A study conducted by Healey et al. (2015), demonstrated the internal consistency of the OSCARS to be 0.80 in patients, and the test-retest reliability of the items to range from 0.50 to 0.70. Silberstein et al. (2018) reported that patients' self-reported OSCARS scores did not correlate with social cognitive performance or informant ratings of everyday functioning. Further, informants' OSCARS ratings were correlated with performance-based measures of social cognition completed by the patients.

2.3.4. Everyday functioning

Real-world functional outcomes were assessed via the 31-item, self-reported version of the Specific Level of Functioning Scale (SLOF; Schneider and Struening, 1983). We used only the self-reported data for this study, because we were interested in the correlations of performance-related confidence, subjective mood states and self-evaluated social cognitive and everyday functioning competence in patients and healthy controls. The correlations between depression and informant ratings of everyday functioning in schizophrenia patients was previously reported (Harvey et al., in press).

2.3.5. Social cognition: performance and self-assessment

Both patients and healthy controls completed a modified version of the Bell Lysaker Emotion Recognition Test (BLERT; Bryson et al., 1997). In this task there are 21 video clips of a male actor who is providing dynamic facial, vocal-tonal, and upper-body movement cues. The test measures the ability of the participant to correctly identify seven emotional states: happiness, sadness, fear, disgust, surprise, anger, or no emotion. Previous studies have demonstrated good reliability and validity in the original version of the BLERT (Bell et al., 1997; Pinkham et al., 2016). In the present study, the BLERT was modified in two ways. First, participants were instructed to respond as rapidly as possible without sacrificing accuracy, which would allow a response prior to the end of the video clip. Second, after responding by identifying the expressed emotion in the video clip, participants then rated how confident they were that their response was correct on a scale from 0 (not at all confident) to 100 (extremely confident). Response time used to answer each item was recorded from the start of the video clip to the moment the participant provided their answer. As in our previous work (Cornacchio et al., 2017) response time was once again used as a proxy for the participant's effort allocation with a longer response time indicative of *more* effort exerted to answer the item.

Since we were interested in confidence when errors were made as well as confidence when the respondent was correct, we made an a priori analysis decision to analyze only those items where the schizophrenia patients had average performance scores of 70% correct or less with the goal of increasing the chances that errors would be made. This led us to eliminate 9 of the 21 items from analysis. The emotions that had been tested in the deleted items spanned five of the different emotions depicted, with three happy, two neutral, two surprised, and one each for anger and surprise. Even after this decision, three schizophrenia patients and three healthy controls had perfect performance on the BLERT; these cases were excluded from the analyses. We present the data as % correct for the remaining 12 items.

2.4. Data analyses

We compared group means on the BLERT variables of correct performance, confidence, and response times when correct and incorrect, as well as on depression, self-reported social cognitive ability, and self-reported everyday social functioning. We also calculated a difference score for the mean confidence rating across items (on a 100 point scale) and proportion of items with correct responses (converted to a 100-point scale) for each individual and compared that across the groups and in correlational analyses. We used Pearson correlations in the two groups separately to relate performance, confidence, and response speed to each other and to the self-reported clinical, everyday functioning, and social cognition variables.

3. Results

Demographic information on the entire sample is presented in Supplemental Table 1, as it was previously published (Pinkham et al., 2018a). Exclusion of three cases per group because of perfect performance on the BLERT led to final samples of 215 schizophrenia patients and 151 healthy controls. Performance on the BLERT, as well as all other variables, is presented in Table 1. Comparisons of group differences found that healthy controls performed better on the BLERT than the schizophrenia patients and they were more confident when correct and overall. There were no differences in confidence when incorrect across the groups and there were no differences in response time for either correct or incorrect responses. Patients with schizophrenia were found to be significantly more confident compared to their average level of performance compared to the healthy controls.

Because effort allocation confidence differences were central to our hypotheses, we performed within group comparisons on confidence and response time for correct and incorrect responses with paired *t*-tests. Confidence was higher when responses were correct for both healthy controls $t(150) = 5.87$, $p < .001$ and patients with schizophrenia, $t(214) = 5.44$, $p < .001$. However, the effect size for HC was $d = 0.7$ and $d = 0.3$ for the patients. We found that healthy controls responded significantly more rapidly when correct than incorrect, $t(150) = 4.92$, $p < .001$; $d = 0.37$. Patients with schizophrenia, in contrast, did not significantly differ in their response times to items where they were correct or incorrect, $t(214) = 1.89$, $p = .06$; $d = 0.13$. Schizophrenia patients reported more depression, poorer social cognitive ability, and poorer everyday functioning than the healthy controls (all $p < .001$).

Interestingly, 28 schizophrenia patients (13%) provided confidence scores of 100% on every item, while only 3 healthy controls (1.4%)

Table 1
Scores on social cognitive tests and clinical and functional self report measures.

	Schizophrenia patients		Healthy controls			
	N = 215		*n* = 151			
	M	SD	M	SD	t	p
Total performance(%)	65.52	18.76	75.31	12.50	5.59	.000
Confidence when correct (0−100)	80.71	19.72	85.59	12.47	2.68	.008
Confidence when incorrect (0–100)	73.39	24.02	76.71	21.23	1.36	.175
Overall confidence (0–100)	78.62	18.34	82.87	12.78	2.45	.015
Difference of overall confidence and overall performance	12.69.	29.54	7.03	16.45	2.35	.020
Response time when correct	15.60	4.92	14.86	3.78	−1.5	.122
Response time when incorrect	16.17	4.49	16.04	4.37	−0.26	.799
BDI scores	15.00	12.51	5.60	5.67	−8.64	.000
OSCARS global	4.50	2.49	2.18	1.55	−10.17	.000
SLOF interpersonal functioning	3.58	0.92	4.06	0.67	5.27	.000

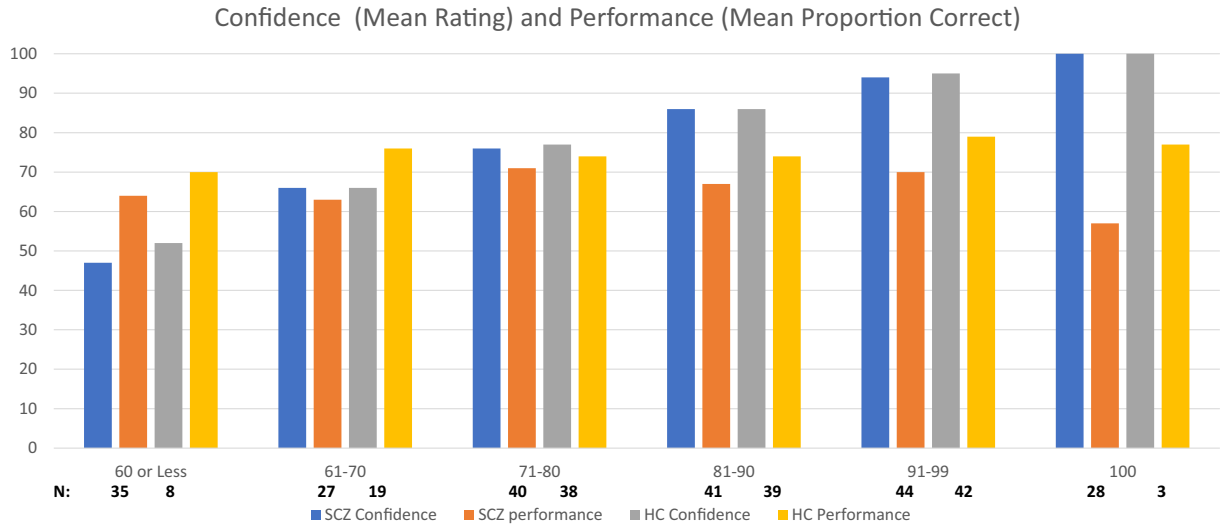

Fig. 1. Confidence and performance on the Bell-Lysaker emotion recognition test by diagnosis and confidence grouping.

Table 2
Intercorrelations of BLERT variables in the two samples.

	Total performance	Overall confidence	Difference of confidence and performance	Response time correct	Response time incorrect
Total performance	1.0	0.17*	−0.65***	−0.09	0.00
Overall confidence	−0.04	1.0	0.64**	−0.34**	−0.41**
Difference of confidence and performance	−0.72***	0.70***	1.0	−0.32**	−0.33**
Response time when correct	0.03	−0.11	−0.03	−1.0	−75***
Response time when incorrect	−0.06	−0.04	−0.05	−0.66***	1.0

Healthy Controls (n = 151) are Above the Diagonal; Schizophrenia Patients (n = 215) Are Below.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

provided these 100% scores. As a result, we divided the sample into groups on the basis of overall confidence into approximately equal sized groups and present confidence and performance scores in Fig. 1. As can be seen in the figure, there was a substantial proportion of cases whose confidence ratings were either lower or higher on across the items than their average performance on the BLERT across items. Within both the schizophrenia patients and the healthy controls, a one-way ANOVA found that there were no differences in performance on the BLERT as a function of level of overall confidence, both $F < 2.18$, both $p > .07$. However, for both groups there was a significant effect of global confidence on the difference of confidence and performance, HC: $F = 22.68$, $p < .001$; SCZ $F = 36.35$, $p < .001$. For both groups, participants with the lowest confidence ratings (< 60) performed at accuracy levels that exceeded their average confidence. For those with higher confidence levels (over 80 on average) there was considerable over-estimation compared to their actual performance on the tasks. The schizophrenia patients who were 100% confident performed significantly more poorly than those who were not, M = 57.5% (SD = 21.5) vs. 67.2% (SD = 18.4) respectively, $t(214) = 2.56$, $p = .011$. Those patients who believed that their performance was perfect also had significantly lower scores on the BDI than those who believed that they had made errors, M = 10.8 (SD = 11.9) vs. M = 15.8 (SD = 12.5) respectively, $t(214) = 2.04$, $p = .048$. For cases with the lowest confidence scores (60 or less), their mean accuracy score was

65% and their confidence rating was a mean of 47 (SD = 11.3). Comparisons of the least confident patients to the other patients found no differences in either performance, $t(214) = 0.52$, $p = .60$, or BDI scores, $t(214) = 0.27$, $p = .79$.

Table 2 presents the intercorrelations of the BLERT variables in the two participant samples. For healthy controls, task performance was correlated with overall confidence, with that correlation found to be quite small. However, the difference of confidence and performance was robustly correlated with both confidence and performance. Overall confidence was correlated with faster response times, both when correct and incorrect. The difference of confidence and performance also predicted tendencies toward more rapid response times both when correct and incorrect. For the schizophrenia patients, overall performance on the BLERT and overall confidence were also robustly predicted by the difference of these two variables. In contrast to the healthy controls, response times were not correlated with confidence, performance, or the difference of confidence and performance.

Next, we examined the correlations between BLERT performance, confidence on the BLERT, response time on the BLERT, and the self-reported variables, including depression, everyday functioning, and social cognitive ability (Table 3). For the HC sample, better performance on the BLERT was correlated significantly, albeit minimally, with better self-reported social cognitive ability. Confidence on the BLERT was also associated with self-reports of better social functioning, Response times on the BLERT, both when correct and incorrect, were correlated with self-reports of better social cognitive ability. For the schizophrenia patients, performance on the BLERT was not associated with any of the self-assessed variables and higher confidence on the BLERT, as in HC, was associated with self-reports of better social functioning. Response times on the BLERT, both when correct and incorrect, were correlated with self-reports of better social cognitive ability. The correlations between confidence on the BLERT and self-reported social functioning were considerably larger in the HC than the SCZ sample.

4. Discussion

This study tried to identify the origin and impact of confidence in relation to self-assessment of functioning in healthy people and in schizophrenic patients. In both samples, confidence in being correct was minimally correlated with objective performance on a social cognitive test. However, the strategies used to solve the task were consistently related to confidence in healthy people. Both overall confidence and relative overconfidence compared to actual performance predicted more rapid responses on task items. Healthy controls adjusted their effort to match the challenge of the task items, while patients did not. Further, healthy people who believed that they had better social cognitive abilities also solved problems with greater speed and there was a significant overlap between self-assessment of social cognitive ability and performance on the task. Schizophrenia patients had reduced levels of overall confidence, when correct and when incorrect, compared to healthy controls. However, in the context of a group difference in confidence, there was a general tendency on the part of the schizophrenia patients to more substantially overestimate their performance compared to their actual scores. On average, the difference between ratings of confidence in correctness of responses and the proportion of problems correctly solved was greater for the schizophrenia patients.

There was a an interesting, transdiagnostic tendency to mis-estimate performance. Many healthy controls and patients with schizophrenia were seen to either over or underestimate their performance on the task. These tendencies were not correlated with self-reported depression for either group as a whole and confidence manifested a substantial transdiagnostic dissociation from performance, because participants grouped on the basis of their self-assessments of their confidence in their performance did perform differently on the BLERT. For example 72 schizophrenia patients (33%) and 35 healthy controls (23%) reported that they were 90% or more certain that they were correct on average, with 13% of the schizophrenia patients reporting that they performed perfectly on every item. The self-report of perfect performance was not accompanied by random performance on the actual task items: patients who believed that their performance was perfect solved 57% of the items and random responding would have led to only 14% correct performance. However, even healthy controls manifest substantial tendencies toward over estimation. In HC these tendencies appear to be correlated with other indicators of confidence, such as reporting better social cognitive ability and solving problems more rapidly both when correct and incorrect.

An important diagnostic difference is the extent to which confidence correlates with both task performance and self-assessments of other elements of functioning. Confidence was associated with performance in healthy controls, in terms of response speed in problem solving, with no such effects in the schizophrenia patients. Further, task performance was correlated, albeit minimally, with confidence in HC. Finally,

Table 3
Correlations of BLERT confidence, performance, and response times with self-reported clinical, functional, and ability variables.

Healthy controls			
	BDI scores	OSCARS global	Social functioning
Total performance	−0.15	−0.20*	0.06
Overall confidence	−0.09	−0.09	0.39***
Difference of confidence and performance	0.05	0.09	0.26**
Response time when correct	−0.03	−0.21*	0.03
Response time when incorrect	−0.05	−0.20*	−0.05

Schizophrenia patients			
	BDI scores	OSCARS global	Social functioning
Total performance	−0.01	−0.11	−0.02
Overall confidence	−0.04	−0.05	0.18*
Difference of confidence and performance	0.02	0.05	0.14
Response time when correct	−0.10	−0.14*	0.09
Response time when incorrect	−0.07	−0.16*	0.06

* $p < .05$.
** $p < .01$.
*** $p < .001$.

assessments of real world social functioning share 16% variance with performance-based confidence in the HC sample, and 3% in the schizophrenia patients. Previous research (Koren et al., 2005) has suggested that schizophrenia patients have dual challenges in evaluating their abilities on performance based measures: they had more difficulty in accurately assessing their performance and they have an additional challenge of using these self-assessments to guide later behavior. This seems consistent with the current study: patients' confidence in their performance was unrelated to their performance, as defined by the correct responses on the task and speed of problem solving, as well as confidence being unrelated to self-assessments of global social cognitive competence.

The predictors of overestimation of performance compared to actual ability did not readily emerge from these analyses. In previous studies, it has been shown that the severity of depression manifests a complex relationship with self-assessment in schizophrenia: people with minimal levels of depression tend to overestimate their skills and their situation (Siu et al., 2015; Harvey et al., 2017). Although the overall severity of depression was not correlated with relative levels of confidence in this study, the most confident schizophrenia patients manifested substantially lower depression scores than the other patients, while the patients with the greatest under-estimation of their performance did not differ in depression severity from the rest of the sample.

There were, however, important correlates of confidence in the healthy controls: the more confident they were in their ability, the faster they completed the items from the BLERT, regardless of whether they were correct or incorrect. The most confident healthy controls clearly overestimated their performance on the BLERT as well. These data converge with previous conceptual models of the role of confidence in decision making in healthy people as described by Dunning, et al. For example, in the current study, there was no feedback provided on performance, so none of the participants were triggered to modify their self- assessments of confidence. In this study, confidence appears to arise from within the individual and to persist uninterrupted in the absence of negative feedback. This confidence affects self-assessments of competence and performance on a social cognition task. The limitation regarding the lack of feedback on performance will be addressed in a new study that is about to begin.

4.1. Conclusions

Over confidence was common in both samples. However, only schizophrenia patients manifested confidence to the extent that they believed that they performed completely perfectly. Confidence that one is correct when performing social cognitive tests was not associated with actual performance to a notable extent in either group, and confidence in healthy people was associated with a test-taking style that included more rapid responses both when correct and incorrect. These data are consistent with previous studies of confidence and self-assessment in both healthy people and people with schizophrenia, again suggesting that patients are largely relying on their current mood state as an index of their global everyday functioning. The important role of low depression severity predicting over-confidence should be a target for future research, as it may be a proxy for lack of external aware and related problems. People with schizophrenia manifest dual process impairment of having trouble developing a conception of their abilities and then using this conception to guide their behavior.

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Conflict of interest statement

Dr. Harvey has received consulting fees or travel reimbursements from Akili, Boehringer Ingelheim, Intra Cellular Therapeutics, OtsukaAmeica, Roche Pharma, Sanofi Pharma, Sunovion Pharma, Takeda Pharma, and Teva Pharma during the past year. He has a research grant from Takeda and from the Stanley Medical Research Foundation.

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