

Emotion Recognition, Emotion Awareness, Metacognition, and Social Functioning in Persons with Schizophrenia

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ABSTRACT

Background: Emotion processing has received significant research attention in persons with schizophrenia. However, some aspects of this construct, such as emotion awareness, are less researched. In addition, there is limited work on metacognitive awareness and social functioning in persons with schizophrenia. **Methods:** Our sample comprised of 27 participants with schizophrenia- and 26 nonclinical controls. The clinical group was assessed on Scale for Assessment of Positive Symptoms, Scale for Assessment of Negative Symptoms, Tool for Recognition of Emotions in Neuropsychiatric Disorders, Toronto Alexithymia Scale, Metacognitive Assessment Scale, self-reflectiveness subscale of Beck's Cognitive Insight Scale, Scale S and Scale U subscales of the Metacognitive Assessment Scale, and Groningen's Social Dysfunction Scale. **Results and Conclusion:** Participants with schizophrenia had greater deficits in emotion recognition than nonclinical controls ($P = 0.05$, $df = 51$). There was no significant correlation between emotion recognition and metacognition in the clinical group. The presence of negative symptoms was significantly associated with social functioning in persons with schizophrenia.

Key words: Alexithymia, emotion recognition, metacognition, schizophrenia, social functioning

Key messages: Clinical symptoms, in particular negative symptoms, play an important role in social functioning in persons with schizophrenia and it is necessary to address these along with social cognition in order to improve functioning.


Schizophrenia is one of a group of psychiatric disorders traditionally called "functional psychoses," comprising of both positive and negative symptoms. Schizophrenia is associated with significant disturbance in social and occupational functioning.^[1]

Neurocognition refers to groups of cognitive abilities that include verbal and visual learning, memory, working memory, attention, and speed of processing.^[1,2]

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Although studies report significant associations between neurocognition and functional deficits, only 20–60% of the variance in functional outcome is attributed to neurocognitive deficits, suggesting that other factors possibly contribute to functional outcomes. Social cognition has been widely examined in relation to functional outcomes in persons with schizophrenia. It is defined as the “mental operations underlying social interactions, which include human ability and capacity to perceive the intentions and dispositions of others” and includes attribution bias, emotion processing, social perception, and theory of mind.^[3,4] Social cognition contributes to functioning beyond the influence of neurocognition and may mediate pathways between neurocognition and functioning.^[1,5] It is correlated with neurocognitive functions and negative symptoms. Impairments in social cognition can be present independent of neurocognitive performance, suggesting that social cognition is a distinct construct that can contribute to functioning.^[6] A meta-analysis examining associations between neurocognition, social cognition, and functional outcome in schizophrenia concluded that social cognition was more strongly related to community functioning than neurocognition.^[7]

Emotion recognition is part of emotion processing and includes facial recognition and identification of emotions.^[4] Deficits in emotion recognition are present in individuals with schizophrenia and partially mediates the relationship between cognitive and social functioning.^[7]

Although there has been extensive research on understanding emotion recognition in schizophrenia, aspects of emotion processing such as alexithymia are now gaining research attention. Sifneos (1996) introduced the term “alexithymia,” now a widely studied phenomenon, to describe individuals with low levels of emotion awareness.^[8] Alexithymia is the difficulty in identifying and describing one’s own emotional state. It has been examined in the context of social cognition.

Emotion awareness is the conscious metarepresentation of an individual’s emotional state and offers the flexibility of emotional response to help adapt.^[9,10]

Research on social cognition in schizophrenia indicates that when trying to reflect on their own and others’ mental activities, persons with schizophrenia have difficulty in identifying emotions, suggesting the presence of deficits in social cognition and metacognition.^[7,11] Lysaker *et al.* note that deficits in emotion recognition may result in part from difficulties in the ability to judge affective and cognitive states of others.^[11] However, insofar as the association with

social functioning is considered, the domain of emotion recognition has received less attention compared to the domain of theory of mind.” Although social cognition is known to affect social functioning in persons with schizophrenia, there is a need to understand the relative contributions of metacognitive processes and emotion recognition to dysfunction.

Metacognition is the evaluation and regulation of one’s own cognitive processes by involving in monitoring and controlling of cognitive processes. Metacognitive deficits are thought to be a key barrier to functioning in schizophrenia. Lysaker *et al.* (2013) found that deficits in social cognition and metacognition represent different forms of dysfunction in schizophrenia. There has been an increasing interest in the study of metacognition in persons with schizophrenia, particularly, aspects such as cognitive insight, self-reflection, and awareness.^[12]

There is a paucity of research examining associated variables, such as alexithymia and metacognitive awareness that reflect an awareness of self. Alexithymia and metacognitive awareness are essential for social competence and functioning. Deficits in these processes are also likely to impact functioning. The findings would also contribute to guidance for training programs in specific aspects of emotion processing and metacognition. We, therefore, examined emotion recognition, emotion awareness, and metacognition in persons with schizophrenia. We hypothesized an association between aspects of emotion processing, namely emotion recognition, emotion awareness, metacognitive processes, and self-reflectiveness. Based on the available literature, we hypothesized that social functioning would be associated with one or more of these variables.

SAMPLE AND METHODS

A cross-sectional design with two groups was adopted. Formal sample size calculation was not carried out; 60 consenting participants were recruited based on specified criteria. The final sample comprised of a clinical sample ($n = 27$) with a primary diagnosis of schizophrenia or schizoaffective disorder (F20, F25; ICD-10)^[13] attending mental health services at a tertiary center in Bangalore, India, and a nonclinical control group ($n = 26$). Participants in the clinical sample were aged between 18 and 45 years, with a minimum of class VIII education, and clinically stable with no major change (not >20%) in medication dose in the preceding 4 months. Persons with a history of epilepsy, organic illness, mental retardation, or current psychoactive substance dependence (except nicotine) and those who have received cognitive behavioral

therapy, cognitive retraining, or electroconvulsive treatment in the preceding 6 months were excluded.

The nonclinical control group was group-matched for age and gender with the clinical sample and recruited from the community using the snowball technique. They were screened for any major medical or psychiatric illness based on a clinical interview.

MEASURES

Scale for Assessment of Negative Symptoms (SANS), a clinician-rated 25-item scale, assesses negative symptoms of schizophrenia.^[14] The scale has adequate psychometric properties (reliability ranges = 0.83 to 0.92; Cronbach's alpha = 0.90).

Scale for Assessment of Positive Symptoms (SAPS)^[15] consists of 34 items that rate the severity of four positive symptoms of schizophrenia. The average interrater reliability for SAPS score was 0.84, with an internal consistency of 0.65.

Tool for Recognition of Emotions in Neuropsychiatric Disorders (TRENDS)^[16] was used to assess emotion recognition and is validated for use in the Indian population. It has a static arm with 52 images and a dynamic arm with 28 images, of six basic emotions – happiness, sadness, anger, fear, surprise, disgust, and a neutral expression and are validated separately. The overall Cronbach's alpha score was 0.67 for static images. In the present study, static images were used in order to reduce the length of time taken for assessment. The total number of images of threatful emotions (fear, anger, disgust) that were identified as any of the non-threatful emotions (sad, happy, and neutral) was calculated and called the TRENDS under-identification score. The total number of images of nonthreatful emotions (sad, happy, neutral) identified as threatful emotion (fear, anger, disgust) was calculated and called the TRENDS over-identification score.^[17]

Social functioning was assessed using the Groningen Social Disabilities Schedule (GSDS).^[18] GSDS assesses the patient's functioning on eight role functions — self-care, family, kinship, partner, parent, social, occupational, and citizen — to give an index of disability. Each role function has subdomains (0 to 3); lower scores indicate better functioning. The GSDS is reported to have good interrater reliability.^[18]

Mean GSDS scores were derived based on domains assessed for each patient (0–1 = mild or no disability, 2 or more = having disability). Mean scores were calculated by summing up the scores in all applicable domains and dividing it by the number of applicable domains. Thus, if the respondent was not a parent, then

his/her scores were added without the parent role and divided by 7. If a respondent had all domains scored, then his/her score would be added for all eight domains and divided by 8. In this study, patients and caregivers were interviewed to assess the patient's current level of functioning (last 4 weeks). Where caregivers were unavailable, the patients were interviewed if they were able to provide reliable information. In the present sample, a majority did not respond to categories of partner and parent domains. However, as no further enquiry was made regarding their attempts to find a partner, these domains were not scored.

Metacognition Assessment Scale (MAS)^[19] is a 30-item rating scale. It assesses metacognitive abilities using verbalizations. The abbreviated version of the MAS is based on the Indian Psychiatric Illness Inventory guidelines to assess illness narrative. It is a semistructured interview^[20] with good overall psychometric properties. Two subscales of MAS — understanding of one's mind/one's ability to think about oneself (Scale S) and understanding others' minds/one's ability to think about others (Scale U) — were used in this study.

The nine-item self-reflectiveness sub-scale of Beck's Cognitive Insight Scale^[21] was used to assess self-reflectiveness. The scale has adequate psychometric properties ($\alpha = 0.70$). Responses range from a scale of 0 (do not agree at all) to 3 (agree completely).

Toronto Alexithymia scale^[22] is a 20-item scale comprising of three factors — difficulties identifying feelings, difficulties expressing feelings, and externally orientated thinking. Higher scores indicate a higher degree of alexithymia. The measure has good psychometric properties (Cronbach's $\alpha = 0.81$; test-retest reliability $r = 0.77$, $P = 0.01$).^[22]

Procedure

The study was reviewed and approved by a department subcommittee and subsequently the Institute Ethics Committee. All patients provided written informed consent. Participation was voluntary, and they were not compensated in any way for their participation.

Following the screening for eligibility, the clinical sample was recruited. A total of 100 case records were screened, of which 50 met the criteria and those patients were contacted for participation. Of these, 27 patients consented to participate — whereas 15 refused consent, eight were not cooperative after the initial measures were administered, due to either interference caused by their symptoms or constraints of time. The clinical sample was administered the SANS, SAPS, MAS, GSDS, the self-reflectiveness subscale of the BCI Scale, TRENDS, and TAS.

The control group was assessed on self-reflectiveness with BCI Scale, TRENDS, and TAS. The MAS was administered only on the clinical sample. All assessments were carried out individually.

Data analysis

Data were analyzed using the Statistical Package for Social Sciences, IBM-SPSS Version 22 for Windows (IBM Corp. Released 2013. Armonk, NY: IBM Corp). The two groups were compared on measures of alexithymia, emotion awareness, and self-reflectiveness using Student’s *t*-test. The Mann–Whitney U test was used to compare the groups on TRENDS, due to the narrow range of scores. The relationship among the variables and social functioning in the clinical sample was examined using Pearson’s product-moment correlation. Stepwise multiple regressions were used to identify factors associated with scores on social functioning.

RESULTS

Demographic characteristics of the sample

The mean age was 31.07 years (SD = 8.9) for the clinical sample and 33.62 years (SD = 7.2) for the nonclinical sample. The majority in the clinical sample were single (74%), males (52%), and graduates (44%). Nearly, 70% were not employed. The control group comprised of a majority of females (62%) and married (69%). A total of 54% of nonclinical participants were either postgraduates or pursuing higher degrees. There was no statistically significant difference between the groups on age, education, or gender. However, there was a significant difference with respect to marital status [Table 1].

The mean age of onset of illness was 25 years (SD = 6.0), mean illness duration was 7 years (SD = 4.07).

A total of 67% had a primary diagnosis of paranoid schizophrenia, a little more than half (56%) had no comorbid diagnosis. The majority were outpatients; some patients were part of the inpatient facility.

Mean scores on SAPS and SANS respectively indicate that at the time of assessment, the clinical sample did not have substantial symptoms [Table 2].

On GSDS, the mean score obtained was 1.58 (SD = 0.60), indicating a trend toward a lower level of social dysfunction. Based on mean GSDS scores, the majority reported mild or no disability in the areas of self-care and kinship. Disability in functioning (≥ 2) was reported in the domains of family, occupation, and social. For 69% and 73%, partner and parent roles, respectively, could not be scored as they were single. Of those who were assessed, an equal number (19%) reported mild or no disability with respect to partner and parent roles [Table 2].

There was a significant difference between the groups on emotion recognition [TRENDS; Table 2]. There was also a significant difference between the groups on underidentification [Table 2], with the clinical sample performing poorer than control group, indicating the presence of emotion recognition deficits in the clinical sample. The two groups did not differ in self-reflectiveness.

Compared to those who were single, those who were married had better levels of functioning with respect to functioning on GSDS ($t = 2.36, df = 23.07, P = 0.027$).

Correlations between measures of positive and negative symptoms, emotion recognition, self-reflectiveness, and metacognition and functioning on the GSDS in the clinical sample [Table 3] indicated a negative correlation between negative symptoms (SANS) and S subscale on MAS, which measures the ability to

Table 1: Demographic characteristics of the sample

Variable	Mean (SD)		<i>t</i> / χ^2	<i>P</i>
	Clinical (N=27)	Nonclinical (N=26)		
Age in years	31.07 (8.88)	33.62 (7.18)	<i>t</i> =1.14	0.25
Frequency (percentage)				
Sex	Male	14 (52%)	$\chi^2=0.95$	0.33
	Female	13 (48%)		
Marital status	Single	20 (74.1%)	$\chi^2 8.30$	0.003
	Married	7 (25.9%)		
Education	Class 12	7 (25.9%)	$\chi^2=18.76$	0.001
	Graduation	12 (44.4%)		
	Postgraduation	8 (29.62%)		
Occupation	Unemployed	19 (70%)	$\chi^2=18.76$	0.001
	Home maker	3 (11%)		
	Student	1 (4%)		
	Professional	2 (8%)		
	Other	2 (7%)		

Table 2: Comparison of scores of the two groups on measures of insight, emotion awareness, emotion recognition, and GSDS (functioning)

Variable	Clinical sample (N=27) Mean (SD)	Control sample (N=26) Mean (SD)	t/U (P)
BCI- self reflectiveness scale	12.04 (4.9)	10.96 (4.43)	0.839 (0.40)
TAS	69.59 (12.41)	66.04 (10.60)	1.11 (0.27)
F1 ability to identify describe feelings	10.30 (5.13)	8.85 (3.62)	1.18 (0.24)
F2 Externally oriented thinking	13.74 (4.95)	12.12 (3.27)	1.31 (0.19)
F3 Ability to identify, describe feelings and daydream	17.19 (4.02)	16.12 (3.05)	1.08 (0.28)
F4 Ability to interpret bodily manifestations of emotions	11.07 (4.23)	9.77 (4.03)	1.14 (0.26)
TRENDS	33.63 (5.24)	37.35 (6.54)	2.286 (0.03)
Under Identification	Median: 4.00 Mean=4.11 (2.11)	Median: 2.00 Mean=2.69 (2.8)	199* (0.01) 0.042
Over Identification	Median 1.00 Mean=1.11 (1.01)	Median: 1.00 Mean=0.85 (0.88)	281* (0.27) 0.31
GSDS (clinical sample n=27)			
GSDS Domains on GSDS	0-1 (mild or no disability)	2 or more	
Self-care	21 (77.77%)	6 (22.22%)	
Family	11 (40.7%)	1 (5.9%)	
Kinship	15 (55.55%)	12 (44.44%)	
Partner	5 (18.5%)	3 (11.11%)	
Parent	5 (18.5%)	2 (7.40%)	
Citizen	12 (44.44%)	15 (55.55%)	
Social	7 (25.92%)	20 (74.07%)	
Occupation	10 (37.03%)	17 (62.9%)	
Variable	Mean	SD	
SAPS	7.00	4.24	
SANS	6.44	3.16	
MAS- S scale	4.07	1.09	
MAS- U Scale	2.91	0.88	

BCI – Beck’s Cognitive Insight Scale; TAS – Toronto Alexithymia Scale; TRENDS – The Tool for Recognition of Emotions in Neuropsychiatric Disorders; GSDS – The Groningen Social Disabilities Schedule; SAPS – Scale for assessment of positive symptoms; SANS – Scale for assessment of negative symptoms; MAS – Metacognitive assessment scale *Mann Whitney U test

think about oneself ($r = -0.42$; $P = 0.04$). Emotion recognition (TRENDS) was negatively correlated with social functioning ($r = -0.31$). Self-reflectiveness (BCI) was positively associated with scores on the U scale of MAS, which measures the ability to understand others’ minds and think about others ($r = 0.43$; $P = 0.028$) and the subscale of TAS, which measures the person’s ability to interpret bodily manifestations of emotions ($r = 0.40$; $P = 0.043$). Greater the negative symptoms, lower was the functioning (GSDS; $r = 0.39$; $P = 0.05$).

A stepwise regression analysis to identify associates of social functioning was conducted. Scores on emotion recognition, emotion awareness, SAPS, and SANS; age; gender; and marital status were entered as independent variables. Negative symptoms were significantly associated with scores on social functioning [Table 4; $t = 2.07$, $P = 0.04$, adjusted $R^2 = 0.0784$].

DISCUSSION

We examined emotion recognition, emotion awareness, metacognition, and social functioning in persons with schizophrenia.

Table 3: Correlations among emotion recognition, self-reflectiveness, symptom severity, metacognition and social functioning in the clinical sample (n=27)

	BCI	TAS	SAPS	SANS	SS scale	U scale	Mean GSDS
TRENDS	-0.10	-0.35	0.07	0.33	0.21	0.23	-0.31
BCI		0.28	0.06	0.06	0.30	0.43*	-0.37
TAS			0.07	0.056	-0.22	0.04	-0.005
SAPS				0.58**	-0.31	0.25	0.22
SANS					-0.40**	-0.21	0.39*
S-subscale of MAS						0.83**	-0.33
U_ subscale of MAS							0.34

* $P=0.05$ level; ** $P=0.01$ level BCI – Beck’s Cognitive Insight Scale; TAS – Toronto Alexithymia Scale; TRENDS – The Tool for Recognition of Emotions in Neuropsychiatric Disorders ; SAPS – Scale for assessment of Positive Symptoms, SANS – Scale for assessment of negative symptoms; Subscales of Metacognitive assessment scale; S – Scale Understanding one’s own mind; U scale – Understanding of Others’ Mind

The clinical sample had a majority of single males, currently not employed and was educated. Education was considered as a categorical variable, and the actual difference in years of education was not calculated. This

Table 4: Social functioning and associates in individuals with schizophrenia

Predictor	Beta (S.E.)	t	P	Adjusted R ²
SANS	0.073 (0.035)	2.07	0.04	0.078
Constant	1.16 (0.21)	5.41	<0.001	

Variables entered-age of onset, Beck's Cognitive Insight Scale, F1 (ability to identify describe feelings), F4 (ability to interpret bodily manifestations of emotions), Toronto Alexithymia Scale, marital status, Tool for Recognition of Emotions in Neuropsychiatric Disorders, SANS. SANS – Scale for assessment of negative symptoms

might be a limitation, as mere years of education may not always indicate the level of intellectual functioning. Age of onset in young adulthood and long duration of illness are similar to those found in other recent studies.^[23-25] Patients had greater positive than negative symptoms, and none had conceptual disorganization.

Social dysfunction was at the lower end of the continuum. The clinical sample had the greatest disability in performing partner/parent roles, socializing with friends, occupation, and family relationships. Disability in occupational domains would likely render them vulnerable to criticism and reduce the ability to hold a stable job. Difficulties in social functioning have been linked to difficulty in affect recognition.^[26] Social dysfunction in these studies appears to be mostly in maintaining interpersonal relationships, with the assumption that emotion recognition deficits affect social communication. This is reflected in our findings as well.

The clinical sample had emotion recognition deficits in the form of overidentification and underidentification. However, underidentification (emotions of anger, fear, and disgust) was greater than overidentification (emotions like sadness, happiness, and neutral facial expression) and the clinical sample differed significantly from the control sample, with the clinical sample performing lower than the control sample. This could be due to the presence of positive symptoms such as paranoid delusions in the clinical sample.

The clinical sample did not have significant deficits in emotion awareness. This is contrary to findings in literature on emotion awareness in persons with schizophrenia. These deficits have been reported more in males and those with paranoid schizophrenia. Emotion awareness is associated with presence of negative symptoms.^[27] Thus, predominance of negative symptoms in this sample, was associated with poor ability to introspect, greater externally oriented thinking, and greater difficulty in identifying one's feelings and daydreams. Emotion awareness has also been reported to be associated with anhedonia, a negative symptom of schizophrenia.^[22] In the present study, emotion awareness was negatively correlated with

emotion recognition. Both domains being domains of emotional processing, they have not been previously studied in association with each other. These results may not be conclusive and need further examination.

The consequences of difficulties in emotion expression and in identifying and describing emotions have been examined in persons with schizophrenia. Alexithymia has been reported to be associated with greater neurocognitive deficits, whereas difficulty in describing feelings has been associated with emotional distress, indicating that alexithymia could be associated with neurocognitive and affective symptoms, differentially.^[9] When those with better or poorer social functioning were compared, those with better functioning had higher emotion awareness.^[26,28,29]

Our results show that although the clinical sample had greater difficulty than nonclinical controls in understanding others' thoughts and emotions as compared to their own, this difference was not statistically significant. The cognitive insight, which includes metacognitive processes and willingness to acknowledge fallibility, differs from clinical insight, which is one's awareness about having an illness, its effects, and the need for treatment. Research evidence on the association between these two constructs is mixed.^[21,30] Self-reflectiveness can be interpreted as "expression of introspection and a willingness to acknowledge fallibility" and suggests a cognitive ability to generate alternative explanations to one's experiences. It has been associated with cognitive insight. Cognitive insight has been associated with better outcomes of cognitive behavior therapy, suggesting that individuals high on this ability may also have better functioning.^[31,32] However, Beck *et al.* (2004) caution against the use of self-reflectiveness subscale for individual clinical assessments and this should be considered when interpreting our findings.^[21]

The clinical sample was educated, with knowledge about the illness. These factors are likely to have contributed to the level of self-reflectiveness. Although results with respect to insight in persons with schizophrenia are mixed, there is evidence that higher self-reflectiveness in persons with schizophrenia leads to better functional outcome.^[31,32]

There was no significant relationship amongst emotion recognition, metacognition, and self-reflectiveness. There is some evidence for the presence of metacognitive deficits in persons with schizophrenia.^[19] In a recent study, metacognitive awareness was significantly related to disorganization symptoms, capacity for relatedness, and flexibility in abstract thought,^[11] which might account for the fact that there were no prominent

deficits in self-reflectiveness or metacognitive processes in the present sample.

We examined the factors associated with social functioning. Marital status, negative symptoms, age of onset, self-reflectiveness, and difficulty in expressing emotions were entered as independent variables. Higher scores on SANS emerged as a significant indicator of greater disability in the clinical sample. This finding is consistent with previous studies that indicate that negative symptoms of schizophrenia is a significant contributor to social functioning.^[32,33] The presence of negative symptoms is known to have a greater adverse impact on social functioning than positive symptoms. Moreover, improvement in negative symptoms improves the psychosocial functioning.^[34,35]

Our results indicate that single persons experienced higher social dysfunction. Although there was a correlation between marital status and social functioning, the direction of causality is unclear. However, it is likely that participants who were married had greater opportunities for engaging in social roles and also were required to meet social expectations as compared to those who were single.

Findings from a recent study suggest that negative symptoms are predictive of deficits in real-world functioning, emphasizing the need to treat negative symptoms. However, findings are mixed, thus indicating the complexity of the relationship between clinical variables, such as age at onset, symptoms, deficits, and functioning.^[33,36] Contrary to findings in the literature, emotion awareness, emotion recognition, or metacognitive processes did not emerge as significant associates of social functioning.

There is a need for more research that can help identify factors impacting social functioning in schizophrenia, as several factors have been implicated in symptom exacerbation and relapse.^[37]

The limitations of the present study include a small sample size and an unequal representation of gender, both of which limit the generalizability of the findings. The absence of a formal sample size calculation is another limitation. A post hoc power analysis conducted based on the current sample ($N = 53$), indicated the power of the study to be 0.612 (effect size = 0.62; $\alpha = 0.05$), suggesting a moderate effect size. Participants being clinically stable at the time of assessment are likely to have had an impact on their responses. GSDD was administered only to the clinical sample. Nonavailability of caregivers is likely to have impacted the rating of difficulties in social contexts. No further questions were asked with respect to attempts

to seek a partner in those who were single. The use of only the static arm of TRENDS limited information obtained with respect to emotion recognition. There are studies in the literature that have used only static images in the assessment of emotion recognition, though.^[38] The use of a single subscale of Beck's Insight Scale is another limitation, as it would not provide a comprehensive view of self-reflection.

Some of the strengths of the study are the use of culturally relevant and appropriate measures for emotion recognition and the inclusion of inpatients who were admitted for psychosocial interventions.

CONCLUSION

Our findings support previous results on emotion recognition deficits in persons with schizophrenia. Emotion recognition and metacognitive processes were not associated and did not impact each other or social functioning, but more rigorous studies are needed to understand the relationship among these variables. Nearly, 85% of the variance of social functioning in schizophrenia still remains unknown.^[39,40] Understanding these nuances can help in enriching treatment approaches by incorporating techniques specifically aimed at addressing these deficits.

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Conflicts of interest

There are no conflicts of interest.

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