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Self-assessment of social cognition in a sample of Lebanese in-patients with schizophrenia

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ABSTRACT

Objective: The primary objective was to evaluate social cognitive complaints in a sample of chronic in-patients with schizophrenia and compare it to healthy controls. The secondary objective was to explore factors related to social cognitive complaints in these patients, such as neurocognition, clinical symptoms, depression, and insight.

Methods: A cross-sectional study conducted between July 2019 and March 2020 at the Psychiatric Hospital of the Cross (HPC)-Lebanon enrolled 120 chronic in-patients diagnosed with schizophrenia and schizoaffective disorders and 60 healthy controls. The Self-Assessment of Social Cognition Impairments (ACSo) scale was used to assess social cognitive complaints.

Results: A significant difference was found between schizophrenia patients and healthy controls in all social cognitive complaints: theory of mind complaint, attributional biases complaint, emotional processes complaint, and social perception and knowledge complaint ($p < 0.001$ for all). All objective cognitive disorders were significantly associated with social cognitive complaints except for attention and speed of information processing. Higher verbal memory and verbal fluency were significantly associated with lower emotional processes complaint scores. The results of the multivariate analysis showed that a higher cognition (Beta = −0.08, p = 0.001) was significantly associated with a lower social cognitive complaint, contrary a higher depression (Beta = 0.38, p = 0.04) was significantly associated with a higher social cognitive complaint, in particular attributional biases complaints.

Conclusion: This study showed that patients with schizophrenia have complaints about their social cognition. It could also demonstrate that subjective social cognitive complaints are correlated with depressive symptoms and objective cognitive deficits among these patients.

Abbreviations: EP, emotional processing; SP, social perception and knowledge; TOM, theory of mind; AB, attributional bias; HPC, Psychiatric Hospital of the Cross; DSM, Diagnostic and Statistical Manual of Mental Disorders; ACSo, Self-Assessment of Social Cognition Impairments; BACS, Brief Assessment of Cognition in Schizophrenia; SASCCS, Self-Assessment Scale of Cognitive Complaints in Schizophrenia; PANSS, Positive and Negative Syndrome Scale; CDSS, Calgary Depression Scale for Schizophrenia; ADS, Anticholinergic Drug Scale; SPSS, Statistical Package for Social Sciences; MANCOVA, multivariate analysis of covariance.

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1. Introduction

Social cognition (SC) has been described as "the ability to construct representations of the relations between oneself and others and to use those representations flexibly to guide social behaviors" (Adolphs, 2001). The term emerged during the overall "cognitive revolution" of the late 1960s and early 1970s. The SC constructs provide a broad theoretical perspective that focuses on how people interpret information within social contexts (Green et al., 2019). It consists of understanding others' emotions, intentions, beliefs, and behaviors (Green et al., 2008). The multi-dimensional framework of social cognition involves functions such as emotional processing (EP), social perception and knowledge (SP), the theory of mind (TOM), and attributional bias (AB) (Green et al., 2008; Bellack et al., 2007).

Studies have indicated that patients with schizophrenia have large SC deficits compared to healthy controls (Peyroux et al., 2019; Deckler et al., 2018; Green et al., 2015). Individuals with schizophrenia often have impairments in SC, which can lead to misinterpretations of other people's social intent, social isolation, and impaired daily social functioning. In such people, social cognitive disability has a more negative influence on everyday life than does non-social cognitive impairment (Fett et al., 2011). People with schizophrenia are likely to avoid social contact and show a decline in functionality as the need for those interactions increases (Abdi and Sharma, 2004; Penn et al., 1997). The most commonly studied aspects of SC in schizophrenia include TOM and EP (Penn et al., 2008; Savla et al., 2012). Studies have shown that social cognitions impairments in patients with schizophrenia remain stable in the early stages of the disease (before and during the first episode of the disease) and chronic conditions and that these impairments are essential determinants of social functioning (Green et al., 2011; Horan et al., 2011a).

In people with schizophrenia, awareness of the disease and related self-assessment abilities, also known as introspective accuracy (IA), are challenged in a variety of ways, including clinical symptom domains, functional skills, cognitive abilities, and, more recently, social cognitive abilities (Amador et al., 1993; Durand et al., 2015; Gould et al., 2015; Silberstein et al., 2018; Harvey and Pinkham, 2015). IA is frequently coupled with introspective bias, in which people either overestimate or underestimate their own performance (Silberstein and Harvey, 2019). Misestimating the ability of patients with schizophrenia can be either by overestimating or underestimating it in about equal proportions across neurocognitive and social cognitive domains (Gould et al., 2015; Silberstein et al., 2018). These patients have problems in SC assessments and self-evaluation of their social cognitive abilities and everyday social consequences (Silberstein et al., 2018). Furthermore, in individuals with schizophrenia and healthy controls, confidence in social cognitive performance showed to be unrelated to actual performance, and high confidence in social cognitive performance predicted lower social outcomes in those with schizophrenia (Cornacchio et al., 2017). Pinkham et al. reported that higher confidence during SC tests was associated with overall worse everyday performance (Pinkham et al., 2018). Similarly, Perez et al. showed that among participants with schizophrenia, overconfidence was a predictor of lower performance in every performance-based task (Perez et al., 2020). Furthermore, in a study among 67 patients with schizophrenia, patients who underestimated their real-world performance had higher cognitive skills than those who overestimated their abilities (Bowie et al., 2007). More recently, Jones et al. reported that confidence in own ability was not linked to actual performance when conducting SC tests (Jones et al., 2020).

Differences between self and contact informant ratings of social cognitive abilities were used to identify discrepancies in the domain of social cognition (Silberstein and Harvey, 2019). Measures based on interviews have been developed to assess cognitive functioning and changes as a result of treatment. The Cognitive Assessment Interview (CAI) is a 10-item questionnaire that evaluates cognitive domains; it can be completed by a patient, informant, and rater (Ventura et al., 2013). The Schizophrenia Cognition Rating Scale (SCoRS) is a 20-question interview that has been effectively used to examine cognition outcomes after treatment (Keefe et al., 2006). Also, the Observable Social Cognition Rating Scale (OSCARS) was created as a self-report or informant-report tool (Healey et al., 2015). However, interview-based evaluations, which include both self-reports and caregiver assessments, have certain limitations. Interview-based approaches likely need considerable patient insight (Medalia and Thysen, 2010), and little is known about the impact of the qualities of caregivers on their reporting on the cognitive functioning of patients (Sabbag et al., 2011). According to Gould et al., deficits in cognitive self-assessment were more significantly associated with poor everyday functioning than performance on neurocognitive tests (Gould et al., 2015). Silberstein et al. found that self-assessment deficits accounted for more variance in social functioning than performance on social cognitive performance-based measures (Silberstein et al., 2018). A study on 60 patients with schizophrenia showed a correlation of $r = 0.06$ between self-reported cognitive impairments and performance on a neuropsychological (NP) battery (Keefe et al., 2006). Informant reports of cognitive impairments were linked to NP performance at $r = 0.42$ (Keefe et al., 2006). The assessors' ratings were even more significantly connected with patients' performance ($r = 0.54$, p.001), based on self and informant reports (Keefe et al., 2006). A recent study found that participants with schizophrenia rated their social functioning significantly better than the observers, while there was no difference on average between their self-reports and the observer ratings (Durand et al., 2021). However, a simple self-assessment measure, such as Self-Assessment of Social Cognition Impairments (ACSo), should be effective in guiding the clinicians' selection of treatment targets (Graux et al., 2019). This tool is the first to measure subjective complaints in social cognition (Graux et al., 2019). The ACSo total score has high psychometric qualities; therefore, it may be used to assess the degree of subjective complaints in social cognition (Graux et al., 2019).

The link between non-social and social cognition in schizophrenia has remained controversial. Several lines of evidence indicate that social and non-social cognitions are different at the behavioral and neural levels (Van Hooren et al., 2008; Fett et al., 2011; Green et al., 2008; Green et al., 2019). Non-social cognitive deficits are a common, significant, and essential symptom of sickness (Green et al., 2019). Impairments can be seen in several domains, such as speed of processing, verbal learning and memory, working memory, attention/vigilance, and reasoning and problem solving (Green et al., 2019). Social cognition refers to the mental processes required to receive, analyze, and process information to engage in appropriate social interactions (Green et al., 2019). Despite these differences, non-social and social cognition use overlapping cognitive processes, such as working memory and perception. Van Hooren et al. conceptualized that non-social and social cognition follow two different pathways termed the "affective pathway" and "neurocognitive pathway" (Van Hooren et al., 2008). The affective pathway refers to the mental operations underlying social interactions, while the neurocognitive pathway refers to the processes of linking and appraising information (Van Hooren et al., 2008). Deckler et al. have found a correlation between neuropsychological assessment and social cognition test performance among the schizophrenia group and healthy controls (Deckler et al., 2018). Previous findings revealed that neurocognition improvement enhanced the development of social cognitive skills in patients with schizophrenia (Lindenmayer et al., 2013) and that social cognition was correlated only with visual learning but not with other neurocognitive domains among patients with schizophrenia (Chan et al., 2018). A study among 137 patients with psychosis showed that social cognition was significantly associated with neurocognition (Barbato et al., 2013).

The correlation between social cognition and psychotic symptoms is inconsistent. Studies have shown an association between positive symptoms and both impairment of facial emotion recognition and TOM (Hall et al., 2004; Kohler et al., 2010; Bora et al., 2009; Montag et al.,

2011). Another study demonstrated a positive correlation between attributional biases and paranoid delusions (Green and Leitman, 2008). Regarding the negative symptoms, social cognitive impairments, particularly TOM impairments, were closely correlated with the severity of negative symptoms (Lincoln et al., 2011). Previous findings revealed that negative symptoms in patients with schizophrenia were related to specific social cognition mechanisms such as anhedonia or affective flattening correlated with emotional processes (Sergi et al., 2007b). A study reported a strong association between TOM performance and disorganized symptoms, while the association with negative and positive symptoms was weak (Fett et al., 2013). Besides, depression, a common aspect in patients with schizophrenia, was related to poor cognitive function (Siu et al., 2015). The severity of depression was associated with an overestimation of cognitive deficits among patients with major depression (Durand et al., 2015; Knight and Baune, 2019); similar findings were reported among patients with schizophrenia (Harvey et al., 2017; Bowie et al., 2007). However, no study could relate depression to social cognition in patients with schizophrenia. Regarding medications, there is no conclusive evidence on the relative influence of antipsychotic therapies on social cognition in schizophrenia (Javed and Charles, 2018). An antipsychotic treatment targeting remission of psychiatric symptoms had a limited impact on social cognition (Sergi et al., 2007a; Penn et al., 2009).

The measurements used to assess SC are limited by methodological difficulties, as the psychometric features of SC tasks are frequently unknown (Bora et al., 2009; Pinkham and Penn, 2006). Also, there is substantial conceptual and measurable overlap among several of the existing SC tasks (Green et al., 2008; Pinkham et al., 2016). Therefore, an alternate method for assessing SC deficiencies efficiently is the use of self-report questionnaires, which are then compared to external markers of competence and performance. Self-assessment of social cognition enables one to become aware of their symptoms and address the negative effects in everyday life. It improves the therapeutic connection and the patient's desire to receive care, especially in cognitive rehabilitation (Vianin, 2013). Thus, it is essential to understand and assess the awareness of patients with schizophrenia of their social cognition.

To the best of our knowledge, no studies in the Arab countries or Lebanon have been conducted to assess self-report social cognition in schizophrenia patients. Therefore, the primary objective of our study was to evaluate social cognitive complaints in a sample of chronic in-patients with schizophrenia and compare it to healthy controls. The secondary objective was to explore factors related to social cognitive complaints in these patients, such as neurocognition, clinical symptoms, depression, and insight.

2. Methods

2.1. Study design and participants

A cross-sectional study conducted at the Psychiatric Hospital of the Cross (HPC)-Lebanon between July 2019 and March 2020 enrolled 120 chronic in-patients diagnosed with schizophrenia and schizoaffective disorders and 60 healthy controls. The inclusion criteria were as follows: patients aged between 18 and 60 years, having an educational level over five years, meeting the DSM-5 criteria (Diagnostic and Statistical Manual of Mental Disorders, fifth edition) for schizophrenia and schizoaffective disorders, receiving antipsychotic medications, and clinically stable. Clinically stable patients are those who have been under adequate treatment for at least the last six months, did not require any increase in the dose of antipsychotic medication over the past three months, and were declared clinically stable by the treating clinician (Sharma et al., 2020).

The inclusion criterion of healthy individuals was the absence of a history of major psychiatric disorders. Exclusion criteria for all participants included brain trauma, neurological disorder, or current substance use disorder that would influence cognitive performance.

2.2. Ethical approval

The Ethics and Research Committee at the Psychiatric Hospital of the Cross approved this study (HPC-024-2018) in compliance with the Hospital's Regulatory Research Protocol. The purpose and requirement of the study were explained to each participant. Consent was obtained as written approval on the informed consent form.

2.3. Procedure

The sample of patients with schizophrenia was selected from a list generated from the hospital's computer software. Out of 180 patients eligible according to the inclusion criteria, 120 patients were included. The remaining 60 patients (40 males and 20 females) were excluded for the following reasons: 22 patients declined to participate, 21 left the hospital, 13 refused to continue the assessment, and 4 had difficulty performing the cognitive tests. The healthy individuals were recruited from the HPC staff and matched for age, education, and gender with schizophrenia patients. Those who agreed to participate in the study were requested to sign a written informed consent form and received no financial compensation in return. The data collection was performed through personal interviews by well-trained, study-independent personnel. The paper has been carefully revised by a professional language editor to improve grammar and readability.

2.4. Measures

The questionnaire used was in Arabic, the native language in Lebanon. The first part assessed the sociodemographic and clinical characteristics of the participants, including age, gender, education level, marital status, monthly income, family history of mental disorders, type of schizophrenia, duration of hospitalization, length of illness, and the number of hospital admissions.

The second part of the questionnaire included the following measures:

Self-Assessment of Social Cognition Impairments (ACSo)

This 20-item self-administered questionnaire was developed to facilitate the collection of social cognition complaints among patients with psychiatric disorders (Graux et al., 2019). It consists of 20 items (5 per domain) organized into four groups (emotional processes, social perception and knowledge, the theory of mind, and attributional biases), rated on a 5-point Likert scale from 0 (never) to 4 (very often) (Graux et al., 2019). The total score was calculated by summing the 20 responses, with higher scores indicating more social cognition complaints. The Cronbach's alpha value was 0.767.

The Brief Assessment of Cognition in Schizophrenia (BACS)

The BACS is a neuropsychological battery, recently validated in Lebanon (Haddad et al., 2021), used to evaluate cognitive functioning in patients with schizophrenia (Keefe et al., 2004). It consists of six subscales, including list learning (verbal memory), digit sequencing (working memory), token motor task (psychomotor function), semantic fluency (verbal fluency), symbol coding (attention and speed of information processing), and Tower of London (executive function) (Keefe et al., 2004). The Cronbach's alpha value was 0.853.

The Self-Assessment Scale of Cognitive Complaints in Schizophrenia (SASCCS)

The SASCCS is a self-report questionnaire used to measure the perception of schizophrenic patients of their cognitive impairment (Johnson et al., 2009). The scale consists of 21 items covering memory (6 questions: 1–3 and 9–11), attention (5 questions: 12–16), executive functions (3 questions: 17–19), language (2 questions: 20–21), and praxia (5 questions: 4–8) (Johnson et al., 2009). Items are rated on a 5-point Likert scale from 0 (never) to 4 (very often). The SASCCS total score is calculated by summing all answers (Johnson et al., 2009). Higher scores indicated higher cognitive impairment complaints (Johnson et al., 2009). The Cronbach's alpha value was 0.911.

Insight Scale for Psychosis (IS)

This self-report questionnaire measures insight in patients with psychotic disorders (Birchwood et al., 1994). It consists of eight items organized into three subscales (awareness of illness, re-labeling of symptoms, and need of treatment), each with a mean score from 0 to 4. The total score calculated by summing subscale scores ranges from 0 to 12. The higher the score, the greater the insight. The Cronbach's alpha value for the total scale was 0.503.

Assessment of clinical symptoms

The clinical symptoms were assessed using the Positive and Negative Syndrome Scale (PANSS) and the Calgary Depression Scale for Schizophrenia (CDSS).

The PANSS, validated in Arabic (Hallit et al., 2017), is a 30-item questionnaire organized into three subscales: positive symptoms (7 items), negative symptoms (7 items), and general psychopathology (16 items) (Kay et al., 1987). All individual items are scored from 1 (absence of symptoms) to 7 (extremely severe symptoms) (Kay et al., 1987). The total score was calculated by summing all answers, with higher scores indicating more severe symptoms (Kay et al., 1987). The Cronbach's alpha values were as follows: 0.684 (total score), 0.769 (positive symptoms), 0.778 (negative symptoms), and 0.836 (general psychopathology).

The CDSS is a 9-item structured interview scale developed by Addington et al. to assess depression in patients with schizophrenia. Eight structured questions assess depression, hopelessness, self-depreciation, guilty ideas of reference, pathological guilt, morning depression, early wakening, and suicide, followed by one observation item (observed depression). Higher scores represent a greater level of depression (Addington et al., 1993). The Cronbach's alpha value was 0.839.

Assessment of medications

The medications used by the patients were retrieved from their medical files. The chlorpromazine dose equivalent was calculated using the Andreasen method (Andreasen et al., 2010). The anticholinergic values were assessed based on the updated version of the Anticholinergic Drug Scale (ADS), where each medication was assigned a numerical value (Carnahan et al., 2006). The total ADS scores were calculated by summing the values of all scheduled medications used by each participant.

2.5. Translation procedure

The ACSo, SASCCS, and CDSS scales were translated from English into Arabic using the forward and backward translation method. Each procedure was performed by a different translator. Discrepancies were resolved by consensus between the original English version and the translated one.

2.6. Data analysis

Data analysis was done using SPSS software version 25. The Shapiro Wilk test was used to check the normality distribution of the ACSo scale and showed that the major dependent variable was normally distributed. A descriptive analysis was performed, where categorical variables were expressed as absolute frequencies and percentages and quantitative variables as means and standard deviations. The independent-sample *t*-test was used to compare continuous variables between groups, whereas the ANOVA test was used to compare three or more means. Pearson correlation test was used to evaluate the association between continuous variables. Cronbach's alpha values were recorded for reliability analysis for all the scales.

ACSo composite scores (z-score) were calculated by averaging the total score from the mean total score of these scales of a healthy control group.

A multivariate analysis of covariance (MANCOVA) was carried out among patients with schizophrenia to assess which neurocognition measures were related to social cognition (the ACSo total scale and subscales were taken as dependent variables), taking into account potential confounding variables: age, gender, educational level, and chlorpromazine equivalent dose. Among patients with schizophrenia, a linear regression model was performed to examine the additional variance of each factor, taking the ACSo scale as the dependent variable and using the blockwise method. Sociodemographic features were entered in the first model, objective neurocognition in the second model, and clinical symptoms in the last model. Age, gender, education, and chlorpromazine equivalent dose were entered as covariates into the models. Significance was set at a $p < 0.05$.

3. Results

3.1. Sample characteristics

Table 1 shows the demographic characteristics of patients with schizophrenia and healthy controls. Mean illness and hospitalization lengths were 20.6 ± 12.4 and 12.4 ± 8.5 years, respectively. The mean number of hospitalization was 6.3 ± 5.65 times, and the mean total PANSS scale was 82.8 ± 27.1. When comparing both groups, schizophrenia patients were more likely to be single, with no income, and a history of psychiatric illness.

Table 1
Sociodemographic and clinical characteristics of the total sample (N = 180).

	Schizophrenia patients (N = 120)	Healthy control (N = 60)	p-value
	Frequency (%)	Frequency (%)	
Gender			
Male	71 (59.2%)	36 (60.0%)	0.91
Female	49 (40.8%)	24 (40.0%)	
Education level			
Complementary	41 (34.2%)	21 (35.0%)	0.73
Secondary	60 (50.0%)	27 (45.0%)	
University	19 (15.8%)	12 (20.0%)	
Marital status			
Single	95 (81.9%)	6 (10.0%)	<0.001
Married	9 (7.8%)	52 (86.7%)	
Widowed	2 (1.7%)	0 (0.0%)	
Divorced	10 (8.6%)	2 (3.3%)	
Monthly income			
No income	27 (23.3%)	0 (0.0%)	<0.001
<1000 $	61 (52.6%)	39 (67.2%)	
1000–2000 $	26 (22.4%)	12 (20.7%)	
>2000 $	2 (1.7%)	7 (12.1%)	
Family history of psychiatric illness			
Yes	42(36.5%)	5 (8.5%)	<0.001
No	73(63.5%)	54 (91.5%)	
Diagnostic (DSM- V)			
Paranoid	56 (46.7%)		
Disorganized	8 (6.7%)		
Undifferentiated.	19 (15.8%)		
Schizoaffective	37 (30.8%)		
	Mean ± SD	Mean ± SD	
Age	48.4 ± 7.6	47.9 ± 7.4	0.67
Duration of illness in years	20.6 ± 12.4		
Duration of hospitalization in years	12.4 ± 8.5		
Number of hospitalization	6.3 ± 5.6		
Total PANSS scale	82.8 ± 27.1		
Positive PANSS	19.9 ± 9.5		
Negative PANSS	17.5 ± 7.9		
General psychopathology	45.5 ± 16.8		

3.2. Medications used

The majority of the participants (76.7%) used typical antipsychotics, while 50% took atypical ones. The mean chlorpromazine equivalent dose was 1041.6 ± 1122.3, the mean anticholinergic drug scale was 7.5 ± 3.1, and the mean duration of medication treatment was 54.7 ± 29.5 months (Table 2).

3.3. Comparison of social cognitive complaint in patients with schizophrenia and healthy controls

A significant difference was found between schizophrenia patients and healthy controls in all social cognitive complaints ($p < 0.001$ for all). The schizophrenia group scored significantly higher mean than the healthy controls in all cognitive complaint tests (social cognition) (more deficits) (Table 3, Fig. 1). Fig. 2 shows mean composite scores for the objective neurocognition (BACS total score) and subtests in patients with schizophrenia compared to healthy controls. A significant difference was found between patients and controls ($p < 0.001$ for all).

Table 2
Description of the type of medication use by the schizophrenia patients.

	Frequency (%)
Atypical ATP	
Yes	60 (50.0%)
No	60 (50.0%)
Typical ATP	
Yes	92 (76.7%)
No	28 (23.3%)
Mood stabilizer	
Yes	59 (49.2%)
No	61 (50.8%)
Benzodiazepines	
Yes	45 (37.5%)
No	75 (62.5%)
Antiepileptic	
Yes	11 (9.2%)
No	109 (90.8%)
Anticholinergic	
Yes	85 (70.8%)
No	35 (29.2%)
Antidepressant SSRI	
Yes	6 (5.0%)
No	114 (95.0%)
Antidepressant TCA	
Yes	9 (7.5%)
No	111 (92.5%)
Other type of medication[a]	
Yes	61 (50.8%)
No	59 (49.2%)

	Mean ± SD
Chlorpromazine equivalent dose	1041.6 ± 1122.3
Anticholinergic drug scale (ADS)	7.5 ± 3.1
Duration of medication treatment (in months)	54.7 ± 29.5

[a] Other type of medication: Anticoagulant, supplement, antimuscarinic, antiarrhythmic, antiparkinsonian, anticoagulant, antiasthmatic, vitamins, thyroid medication, stomach protection, antidiabetic, statin, antihypertensive and Proton-pump inhibitors.

Table 3
Difference of social cognitive complaint between schizophrenia patients and healthy controls.

	Schizophrenia patients (N = 120)	Healthy control (N = 60)	Effect Size d_{Cohen}	p-value
	Mean ± SD	Mean ± SD		
Social cognitive complaint	29.3 ± 11.1	12.5 ± 4.8	1.96	<0.001
Theory of Mind complaint (TOM)	8.4 ± 3.7	3.8 ± 2.5	1.45	<0.001
Attributional Biases complaint (AB)	7.6 ± 3.3	4.8 ± 2.4	0.97	<0.001
Emotional processes complaint (EP)	7.0 ± 4.4	1.1 ± 1.7	1.76	<0.001
Social perception and knowledge complaint (SP)	6.4 ± 3.3	2.1 ± 1.7	1.63	<0.001

3.4. Correlations between social cognitive complaints and quantitative measures

The neurocognitive complaints were significantly correlated with all social cognitive complaints.

All objective cognitions (BACS total score and subtests) were significantly associated with social cognitive complaints, except for the attention and speed of information processing. Also, the attributional biases complaint was not associated with any of the objective neurocognition domains.

The total PANSS scale and the general psychopathology PANSS scale were significantly correlated with all social cognitive complaints among patients with schizophrenia. The positive PANSS scale was correlated only with the theory of mind and attributional biases, while no correlation has been found with the negative PANSS scale. Higher depression ($r = 0.18$, $p = 0.04$), and higher chlorpromazine equivalent dose ($r = 0.21$, $p = 0.03$) were significantly associated with higher social cognitive complaint (Table 4). Also, higher illness ($r = 0.26$, $p = 0.004$) and hospitalization ($r = 0.18$, $p = 0.04$) lengths were significantly associated with higher social cognitive complaint. Age and insight were not associated with social cognitive complaints.

3.5. Bivariate analysis: correlates of social cognition

A higher mean total ACSo score was found in the female gender as compared to male participants ($M = 31.8$ vs. $M = 27.5$, $p = 0.03$), and in those taking an anticholinergic medication as compared to those who do not ($M = 31.2$ vs. $M = 24.6$, $p = 0.003$) (Table 5).

3.6. Multivariable analysis

The MANCOVA analysis was performed among patients with schizophrenia taking the total social cognition test and subtests as the dependent variables and the neurocognition subtests and depression as the independent variable, adjusting for the covariates (age, gender, and education level). The results showed that higher verbal memory and verbal fluency were significantly associated with lower social cognition and emotional processes complaints scores. However, higher scores of attention and speed of information processing were significantly associated with a higher emotional process complaint score. No significant association was found for other neurocognition domains with the social cognition complaint. However, higher depression was only related to higher attributional biases complaint (Table 6).

The multiple regression models are displayed in Table 7. The first analysis taking the total social cognition scale as the dependent variable and the sociodemographic characteristics as the independent variables showed that female gender (Beta = 4.76, $p = 0.02$) was significantly associated with higher social cognitive complaints, while university

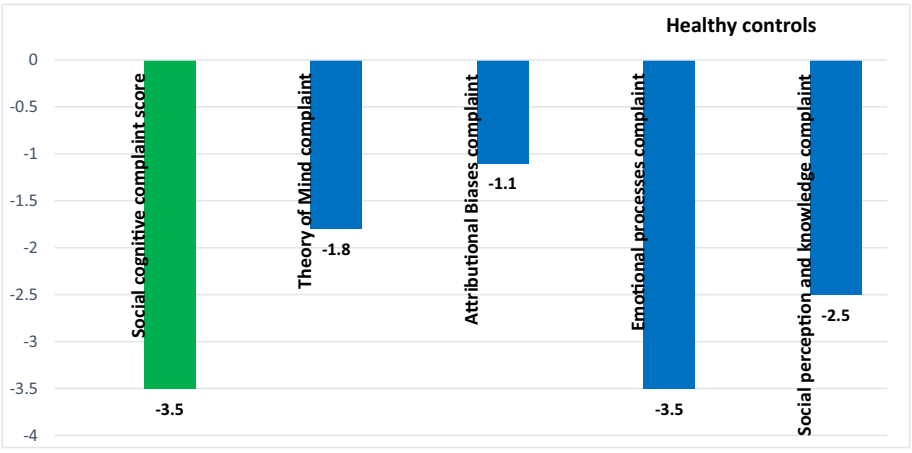

Fig. 1. Composite scores for the total social cognitive complaint score and subtests in patients with schizophrenia standardized to healthy controls.

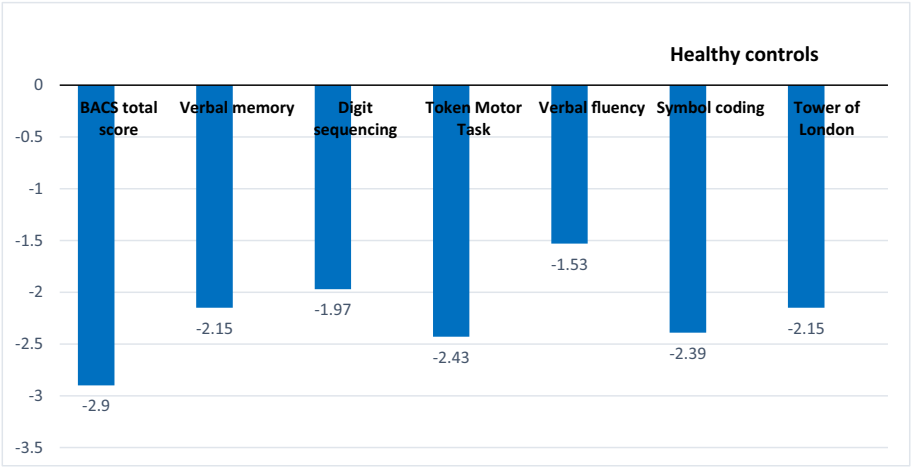

Fig. 2. Composite scores for the objective neurocognition (BACS total score) and subtests in patients with schizophrenia standardized to healthy controls.

Table 4
Factors associated with social cognitive complaint (ACSo) in patients with schizophrenia.*, **, ***

	Social cognitive complaint (ACSo)	Theory of Mind complaint (TOM)	Attributional Biases complaint (AB)	Emotional processes complaint (EP)	Social perception and knowledge complaint (SP)
Neurocognitive complaint	0.62***	0.40***	0.37***	0.55***	0.52***
Objective cognition (BACS total score)	−0.43***	−0.37***	−0.15	−0.39***	−0.35***
Verbal memory	−0.44***	−0.37***	−0.12	−0.44***	−0.34***
Working memory	−0.34***	−0.26***	−0.13	−0.30***	−0.31***
Motor speed	−0.39***	−0.34***	−0.11	−0.36***	−0.32***
Verbal fluency	−0.43***	−0.34***	−0.15	−0.42***	−0.33***
Attention and speed of information processing	−0.17	−0.18	−0.08	−0.11	−0.16
Executive function	−0.30***	−0.26***	−0.12	−0.27***	−0.21***
Total PANSS scale	0.37***	0.24***	0.31**	0.27***	0.29***
Negative PANSS	0.15	0.08	0.06	0.11	0.17
Positive PANSS	0.24***	0.21*	0.22*	0.14	0.14
General psychopathology PANSS	0.40***	0.23*	0.35***	0.31**	0.30***
Depression	0.18*	0.07	0.33***	0.02	0.16
Insight	−0.06	−0.007	−0.12	−0.06	−0.01
Chlorpromazine equivalent dose	0.21*	0.22*	0.11	0.12	0.17

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

Table 5
Bivariate analysis taking the social cognitive complaint as the dependent variable among patients with schizophrenia.

	Total ACSo	p-value
	Mean SD	
Gender		
Male	27.5 ± 9.8	**0.03**
Female	31.8 ± 12.3	
Education level		
Complementary	31.9 ± 12.0	0.08
Secondary	28.8 ± 10.8	
University	25.2 ± 8.6	
Atypical antipsychotic		
Yes	30.0 ± 10.6	0.50
No	28.6 ± 11.5	
Typical antipsychotic		
Yes	29.5 ± 11.9	0.66
No	28.5 ± 7.9	
Benzodiazepines medication		
Yes	27.4 ± 10.3	0.16
No	30.4 ± 11.4	
Anticholinergic medication		
Yes	31.2 ± 11.4	**0.003**
No	24.6 ± 8.9	

Values marked in bold are significant.

education level (Beta = −7.08, p = 0.02) was significantly associated with a lower social cognitive complaint (Table 7, Model 1). In the second model, when adding the total BACS scale as the independent variable, the results showed that a higher BACS total score (Beta = −0.08, p < 0.001) was significantly associated with a lower social cognitive complaint (Table 7, Model 2). Clinical symptoms were added in the third model, but no significant association was found with the social cognitive complaint. Higher objective cognition (Beta = −0.08, p = 0.001) was significantly associated with lower total social cognitive complaints. However, higher depression (Beta = 0.38, p = 0.04) was significantly associated with higher social cognitive complaints (Table 7, Model 3).

4. Discussion

Our study evaluated the subjective complaints of social cognition among clinically stable patients with schizophrenia. The results showed that patients with schizophrenia complain about their social cognition, particularly emotion and social perceptions. Additionally, all social cognitive complaint subscales showed a significant correlation with neurocognition except the attributional biases complaint. The multivariate analysis revealed that only verbal memory and verbal fluency deficits were significantly related to emotional processes complaints, while depression was related to attributional biases complaints. Also, the two most predictive variables of subjective social cognitive complaints were objective cognition and depression.

Our results showed that patients with schizophrenia reported complaints across all social cognition domains compared to healthy control participants. Consistently, a study conducted by Perez et al. among 218 outpatients diagnosed with schizophrenia and 154 healthy controls showed that participants with schizophrenia manifest overconfidence on the emotion perception test and lower performance on several social cognition tasks (Perez et al., 2020). Another study also among 218 schizophrenia patients and 154 healthy controls found that many patients with schizophrenia over or underestimate their self-assessment of social cognition (Jones et al., 2020). A study conducted by Raffard et al. among 30 patients with schizophrenia and 20 controls found more subjective cognitive complaints among patients than controls (Raffard et al., 2020). Moritz et al. reported that schizophrenia participants were overconfident, even when making perceptual judgment mistakes,

Table 6
Multivariate analysis of covariance (MANCOVA) among patients with schizophrenia.

	Beta	p-value	Partial eta squared	95% confidence interval	
				Lower bound	Upper bound
Social cognitive complaint total score					
BACS - Verbal memory	−0.286	**0.031**	0.042	−0.544	−0.027
BACS - working memory	0.227	0.446	0.005	−0.362	0.816
BACS - Motor speed	−0.140	0.079	0.028	−0.296	0.016
BACS - verbal fluency	−0.351	**0.029**	0.044	−0.664	−0.037
BACS - Attention and speed of information processing	0.178	0.079	0.028	−0.021	0.378
BACS - executive function	−0.083	0.642	0.002	−0.437	0.271
Depression (Calgary scale)	0.373	**0.036**	0.040	0.024	0.722
Theory of Mind complaint (TOM)					
BACS - Verbal memory	−0.081	0.091	0.026	−0.175	0.013
BACS - working memory	0.121	0.262	0.012	−0.092	0.335
BACS - Motor speed	−0.049	0.088	0.027	−0.106	0.007
BACS - verbal fluency	−0.089	0.123	0.022	−0.203	0.025
BACS - Attention and speed of information processing	0.039	0.282	0.011	−0.033	0.112
BACS - executive function	−0.040	0.534	0.004	−0.169	0.088
Depression (Calgary scale)	0.054	0.396	0.007	−0.072	0.181
Attributional Biases complaint (AB)					
BACS - Verbal memory	−0.015	0.732	0.001	−0.102	0.072
BACS - working memory	0.038	0.701	0.001	−0.159	0.235
BACS - Motor speed	−0.012	0.655	0.002	−0.064	0.040
BACS - verbal fluency	−0.039	0.467	0.005	−0.143	0.066
BACS - Attention and speed of information processing	−0.001	0.985	0.000	−0.067	0.066
BACS - executive function	−0.049	0.415	0.006	−0.167	0.069
Depression (Calgary scale)	0.229	**<0.0001**	0.123	0.112	0.346
Emotional processes complaint (EP)					
BACS - Verbal memory	−0.138	0.009	0.062	−0.241	−0.036
BACS - working memory	0.084	0.475	0.005	−0.149	0.318
BACS - Motor speed	−0.038	0.222	0.014	−0.100	0.024
BACS - verbal fluency	−0.155	**0.015**	0.054	−0.280	−0.031
BACS - Attention and speed of information processing	0.106	**0.009**	0.062	0.027	0.185
BACS - executive function	−0.015	0.831	0.000	−0.155	0.125
Depression (Calgary scale)	−0.005	0.946	0.000	−0.143	0.133
Social perception and knowledge complaint (SP)					
BACS - Verbal memory	−0.052	0.215	0.014	−0.133	0.030

(continued on next page)

Table 6 (*continued*)

	Beta	p-value	Partial eta squared	95% confidence interval	
				Lower bound	Upper bound
BACS - working memory	−0.017	0.857	0.000	−0.203	0.169
BACS - Motor speed	−0.041	0.107	0.024	−0.090	0.009
BACS - verbal fluency	−0.068	0.180	0.017	−0.167	0.032
BACS - Attention and speed of information processing	0.033	0.296	0.010	−0.030	0.097
BACS - executive function	0.021	0.708	0.001	−0.091	0.133
Depression (Calgary scale)	0.094	0.093	0.026	−0.016	0.205

Covariates are: age, gender and education level.
Values marked in bold are significant.

compared to a control group (Moritz et al., 2014). A meta-analysis of 22 studies found that, when compared to controls, patients experienced more subjective cognitive complaints (Potvin et al., 2014). Similarly, studies among patients with schizophrenia could demonstrate significant deficits across all social cognition domains compared to healthy controls (Charernboon and Patumanond, 2017, Peyroux et al., 2019). Our results could confirm literature findings showing that social cognition impairments represent core symptoms and a trait characteristic of schizophrenia and that patients with schizophrenia do complain of these deficits but do not have any representation of the nature of their difficulties (Potvin et al., 2014).

Emotion perception complaint was the most impaired sub-domain of social cognition, followed by social perception complaint and theory of mind, as reported in our results, showing a large effect size for emotional perception and social perception (1.76 and 1.63, respectively). Other studies have shown that the theory of mind and emotion perception had the largest effect size (Charernboon and Patumanond, 2017; Peyroux et al., 2019). A meta-analysis found an effect size of 1.04, 0.96, and 0.89 for social perception, the theory of mind, and emotion perception, respectively (Savla et al., 2013). Another meta-analysis reported a high effect size for the theory of mind (0.9) (Bora et al., 2009). Our results also revealed a higher effect size in all domains compared to previous findings, likely because hospitalized patients with a longer duration of illness have higher social perception and emotion processing deficits (Savla et al., 2013). The different tests used to assess social cognition and the different adjusted variables (age, gender, education level, duration of illness, and others) could explain effect size variations within the domains across the studies. Emotion perception impairments are more

Table 7
Multivariable analysis among patients with schizophrenia.

Model 1: Linear regression taking the social cognitive complaint as the dependent variable and the sociodemographic characteristics as the independent variables

	Unstandardized Beta	Standardized Beta	p-value	Confidence interval	
				Lower	Upper
Gender (female vs male*)	**4.76**	**0.21**	**0.02**	**0.78**	**8.74**
Age	0.07	0.05	0.55	−0.18	0.33
Education secondary vs complementary*	−3.35	−0.15	0.13	−7.68	0.97
Education university vs complementary*	**−7.08**	**−0.23**	**0.02**	**−13.04**	**−1.13**
$R^2 = 0.057$					

Variables entered in the models: gender, age and education level.

Model 2: Linear regression taking the social cognitive complaint as the dependent variable and the objective cognition as the independent variable

	Unstandardized Beta	Standardized Beta	p-value	Confidence Interval	
				Lower	Upper
Age	−0.02	−0.01	0.87	−0.27	0.23
Gender (female vs male*)	3.56	0.15	0.08	−0.54	7.66
Education secondary vs complementary*	−1.87	−0.08	0.38	−6.14	2.39
Education university vs complementary*	−4.65	−0.15	0.14	−10.83	1.54
BACS total score	**−0.08**	**−0.34**	**0.001**	**−0.13**	**−0.03**
Chlorpromazine equivalent dose	0.001	0.10	0.29	−0.001	0.003
$R^2 = 0.189$					

Variables entered in the models: gender, age, education level, chlorpromazine equivalent dose and objective neurocognition (BACS total score).

Model 3: Linear regression taking the social cognitive complaint as the dependent variable and the objective cognition and the clinical symptoms and insight as the independent variable

	Unstandardized Beta	Standardized Beta	p-value	Confidence Interval	
				Lower	Upper
Age	0.004	0.003	0.97	−0.23	0.24
Gender (female vs male*)	3.57	0.15	0.07	−0.31	7.45
Education secondary vs complementary*	−2.28	−0.10	0.27	−6.37	1.80
Education university vs complementary*	−2.66	−0.08	0.37	−8.57	3.25
BACS total score	**−0.08**	**−0.33**	**0.001**	**−0.13**	**−0.03**
Depression scale	**0.38**	**0.17**	**0.04**	**0.02**	**0.74**
Positive PANSS	0.18	0.16	0.13	−0.05	0.43
Negative PANSS	0.07	0.05	0.56	−0.17	0.32
General psychopathology PANSS	0.10	0.15	0.15	−0.04	0.25
Chlorpromazine equivalent dose	0.001	0.09	0.27	−0.001	0.003
Insight	0.16	0.03	0.72	−0.71	1.03
$R^2 = 0.433$					

Variables entered in the models: gender, age, education level, chlorpromazine equivalent dose, PANSS subscales, depression scale and objective neurocognition (BACS total score).

Values marked in Bold are significant. * Reference group.

frequent among patients with schizophrenia than healthy controls (Penn et al., 2008). Also, chronic patients display deficits in the perception of feelings and have difficulty recognizing emotions and reading facial expressions (García et al., 2018). Schizophrenia patients tend to have extreme difficulties regulating the interaction between their emotions and their cognitive processing (García et al., 2018). Also, social perception (the ability to understand social roles, rules, and context) is deficient in patients with schizophrenia; however, this domain has not been examined as thoroughly as the theory of mind and emotion perception. Future studies are needed to evaluate these domains and the intensity of their influence.

All social cognitive complaints scores were correlated with neurocognition tests in patients with schizophrenia, except for the attributional biases, attention, and speed of information processing domains. The study done by Graux et al. among 89 patients with psychiatric disorders found that the ACSo scale was correlated with all subjective neurocognitive assessments (Graux et al., 2019). Also, by comparing patients' subjective cognitive complaints to their objective cognitive performance, some studies have shown a lack of correlation between subjective and objective measures (Cella et al., 2014; Donohoe et al., 2009; Sellwood et al., 2013), while others have reported significant associations between the two types of measures (Hake et al., 2007; Stip et al., 2003; Potvin et al., 2014). In principle, both forms of cognitive function are associated to some extent, as social cognition and neurocognition use overlapping cognitive processes (Green et al., 2015). The absence of correlation with some domains could be attributed to the test used to assess social cognition, which was self-reported and might have measured and reflected differently social cognition domains than other neurocognitive areas. The correlation between social cognition and neurocognition is still controversial, with some evidence suggesting overlapping domains, while others report that these domains do not overlap in patients with schizophrenia (Van Hooren et al., 2008; Fett et al., 2011). Several factors could account for the heterogeneity of the results of studies looking at subjective cognitive complaints in schizophrenia, including the scale used to measure these and the cognitive domains studied. Also, few studies have explored the relationship between subjective social complaints and objective cognition in schizophrenia, making it difficult to interpret the results adequately. Further research on the relationship between these two areas is needed to elucidate these aspects and enhance productive activities in the social context of patients with schizophrenia.

The multivariable analysis showed that neurocognition, particularly verbal memory and verbal fluency, were correlated with social cognitive complaints and that attention and speed of information processing were significantly associated with emotional processing, in line with other studies (Tsotsi et al., 2015; Lahera et al., 2017). It is well established that various aspects of social cognitive performance appear to likely require different neurocognitive abilities for successful delivery, at least superficially (Deckler et al., 2018). Verbal working memory requires knowing past statements, probably involving episodic memory competence, and the recollection of immediately prior information would facilitate performance on many different social cognitive tests (Deckler et al., 2018). Also, better processing speed is required for success on some social cognitive assessments (Deckler et al., 2018). It is hypothesized that reevaluating a stimulus consistently over a prolonged period and processing more information (by encouraging skills such as the speed of processing or focused attention) leads to improved emotional recognition and processing of more information (Lahera et al., 2017).

Furthermore, the regression analysis showed that the two most predictive social cognition variables are objective cognition and depression. A study evaluating subjective complaints and objective cognitive performance showed a lack of association between the two measures (Prouteau et al., 2004). Other studies found a positive correlation between some tests of objective cognition, such as verbal memory and subjective cognitive complaints (Lysaker et al., 2007; Lysaker et al., 2008; Lysaker et al., 2005). Neurocognition and social cognition are associated in different areas where a deficit in cognitive domains could be related to poor social functioning (Green et al., 2000). It is well known that many patients with schizophrenia have a lack of awareness of the cognitive function and might misinterpret their cognition (García-Laredo, 2018). However, the results of these studies remain quite heterogeneous and do not show a direct link between objective and subjective cognitive complaints. The evaluation of the relationship between these domains needs further investigation to clarify the nature of this association.

In our study, depression was related to social cognitive complaints, and more specifically, to attributional biases complaints. Patients with more severe depression underestimate their abilities, although this appears to reflect a form of response bias in reporting their social cognition as in the attributional complaint. The dependence on mood states to form global and specific judgments on social ability could be one source of this bias. Depressed people have a negative view that may influence their affective experience, making them believe life is unpleasant. Furthermore, such people exhibit attributional biases for the events and have negative interpretations of ambiguous information and attentional biases towards threatening stimuli (Rubenstein et al., 2016). A study has demonstrated that depression severity was a predictor of self-reported social global functioning, with individuals with lower depressive symptoms reporting significantly greater levels of everyday social functioning (Oliveri et al., 2020). Previous studies have revealed that the severity of depression in schizophrenia has a complex link with self-assessment: people with low levels of depression tend to exaggerate their abilities and their situation (Harvey et al., 2017; Siu et al., 2015). Patients with the greatest under-estimation of their social cognition had significantly lower depression scores than the rest of the group, while those with the greatest under-estimation of their performance had no difference in depression severity from the rest of the group (Jones et al., 2020). A meta-analysis has found a weak association between depressive symptoms and cognitive complaints (Potvin et al., 2014). Several other studies have reported similar results (Burton and Twamley, 2015; Burton et al., 2016; Gould et al., 2015; Raffard et al., 2020). Raffard et al. reported a significant relationship between psychoaffective measures (state anxiety and depression) and cognitive complaints in the clinical group (Raffard et al., 2020). It has been hypothesized that subjective cognitive complaints in schizophrenia are more likely linked to psychoaffective variables like depression and anxiety than psychotic symptoms or cognitive impairments (Cella et al., 2014; Bayard et al., 2009). According to our results, the presence of attribution bias in schizophrenic patients should lead to a search for comorbid depression in these patients, while other social complaints (theory of the mind, emotional perception, and social perception) are more related to cognitive disorders.

Our results showed a lack of association between insight and social cognitive complaints. A meta-analysis found a weak association between subjective complaints and insight into illness (Potvin et al., 2014). Also, previous studies showed that patients with schizophrenia might be aware of their cognitive deficits despite having no insight into their condition or symptoms (Bayard et al., 2009; Seco et al., 2010; Zhornitsky et al., 2011; Baliga et al., 2020). Moreover, our results showed that all social cognitive complaints correlated with disorganized symptoms but not negative symptoms. A meta-analysis could not find a relationship between subjective cognition and the positive and negative symptoms of schizophrenia (Potvin et al., 2014). Studies and meta-analyses have found that disorganization symptoms are significantly associated with impaired social cognition (Horan et al., 2011b; Javed and Charles, 2018; Fett et al., 2013; Subotnik et al., 2020). A likely overlap between the content of the PANSS and social cognition could explain our results. The general psychopathology component of the PANSS scale consists of many cognition deficits, such as disorientation, poor attention, lack of insight, and active social avoidance. Patients with disorganized symptoms can have a deficit in conceptual understanding during a social situation that affects their social behavior (Fett et al., 2013). For positive

symptoms, only the TOM and attributional biases were correlated. Oppositely, other studies have found a positive correlation with negative symptoms but not with positive symptoms (Peyroux et al., 2019; Charernboon and Patumanond, 2017; Kohler et al., 2010). One possible explanation would be that hospitalization is usually associated with increased positive (rather than negative) symptoms and that some elements of social cognition may be affected by psychosis. Another likely reason for our findings is the scale used to assess social cognition and its ability to discriminate between the different aspects, thus the fluctuating results across studies.

4.1. Clinical implications

Social cognition impairments detected in patients with schizophrenia could explain the deficits in social skills and social functions. Our results emphasize the importance of subjective complaints of social cognition in patients with schizophrenia, which could be of particular relevance in the field of cognitive remediation and therapy. Social cognition has been identified as a crucial driver to recovery as it is an essential predictor of functional outcomes in individuals with schizophrenia.

4.2. Limitation

Our study has several limitations. Its cross-sectional design and the hospital setting do not allow the extrapolation of results to schizophrenia out-patients. A lack of power to detect some associations is possible due to the small sample size, which might explain non-significant results. A selection bias might have occurred due to the non-representability of the healthy controls group since it was selected from the hospital staff. Moreover, the population consists of chronically hospitalized patients whose cognitive function might be severely impaired, which may lead to a selection bias. Information bias is also likely as the information was self-reported by the participants; accurate details could not be provided during the face-to-face interview. Another possible limitation is the use of a self-report instrument to assess social cognition (ACSo) instead of using an informant, clinician, or social cognitive assessment measure. It would have been of interest if clinicians assessed social cognition and cognitive complaints. Additionally, this study did not use a specific instrument, such as the Global Assessment of Functioning, to assess functioning. Residual confounding bias is also possible since there could be factors related to social cognitive complaints that were not measured in this study.

5. Conclusion

This study showed that patients with schizophrenia have complaints about their social cognition and found a correlation between neurocognition and social cognitive complaints except for attributional biases, suggesting an overlap between the two domains. Depression was associated with attributional biases complaint. It could also demonstrate that subjective social cognitive complaints are correlated with depressive symptoms and objective cognitive deficits of patients.

Further prospective studies with a larger sample size are needed to fully understand the subjective complaint of social cognition among patients with schizophrenia to help remediate impairments in everyday functioning.

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Availability of data and materials

Data can be made available under reasonable request form the corresponding author.

CRediT authorship contribution statement

JPC and BC designed the study; CH participated in the acquisition, analysis, and interpretation of the data, and drafted the initial manuscript; PS, HS, SH revised the article critically for important intellectual content.

Declaration of competing interest

None.

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