

## Research Paper

## Differences in social perception in people with schizophrenia and bipolar disorder

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## ABSTRACT

People with schizophrenia have difficulties recognizing other people's expressions, emotional states, and intentions; however, much less is known about their ability to perceive and understand social interactions. We used scenes depicting social situations to compare responses from 90 volunteers (healthy controls [HC], schizophrenia [SZ], and bipolar disorder [BD] outpatients from the Hospital del Salvador in Valparaíso, Chile) to the question: "What do you think is happening in the scene?" Independent blind raters assigned a score of 0 (absent), 1 (partial), or 2 (present) for each item based on whether the description identifies a) the context, b) the people, and c) the interaction depicted in the scenes. Regarding the context of the scenes, the SZ and BD groups scored significantly lower than the HC group, with no significant difference between the SZ and BD groups. Regarding the identification of the people and the interactions, the SZ group scored lower than the HC and BD groups, with no significant difference between the HC and BD groups. An ANCOVA was used to examine the relationship between diagnosis, cognitive performance, and the results of the social perception test. The diagnosis had an effect on context ( $p = .001$ ) and people ( $p = .0001$ ) but not on interactions ( $p = .08$ ). Cognitive performance had a significant effect on interactions ( $p = .008$ ) but not on context ( $p = .88$ ) or people ( $p = .62$ ). Our main result is that people with schizophrenia may have significant difficulties perceiving and understanding social encounters between other people.

## 1. Introduction

People with schizophrenia face significant interpersonal difficulties, including reduced ability to form close relationships, lower success in obtaining and maintaining employment (Bouwman et al., 2015), poorer participation in social activities (Bellack et al., n.d.), and, in general, less adequate social functioning (Gorostiaga et al., 2017). Although there is a significant degree of overlap with a general cognitive deficit, these problems have been attributed to impaired social cognition (Halverson et al., 2019; Schmidt et al., 2011), generally referring to the mental operations that underlie social interactions, including perceiving, interpreting, and generating responses to the intentions, dispositions, and behaviors of others (Green et al., 2008). Impaired social cognition not only limits the possibilities for adequate psychosocial functioning but can also, predispose biologically vulnerable individuals, to the experience of psychotic symptoms (Mier and Kirsch, 2017).

The most described social cognitive impairments in schizophrenia are deficits in emotion perception, social perception, social cognition,

theory of mind, and attributional style (Green et al., 2008). Briefly, emotion perception is the ability to identify the emotions of others accurately; theory of mind is the ability to interpret someone's speech or actions in terms of their intentions; and attributional style is the habitual way of explaining events as a consequence of internal (personal), external (another person), or situational factors (Green et al., 2015; Savla et al., 2013).

Regarding social perception, the NIMH Workshop on Definitions, Assessment, and Research Opportunities (Green et al., 2008), defined it as "a person's ability to identify social roles, social rules and social context," including "relationship perception, which refers to the perception of the nature of relationships between people." However, this partially overlaps with the definition of social knowledge, which, in turn, is described as "awareness of the roles, rules, and goals that characterize specific social situations and guide social interactions (Green et al., 2008)." Pinkham (2014), on the other hand, ignores this difference and considers social perception as "the decoding and interpretation of social cues in others. It includes the ability to integrate

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contextual information and social knowledge into judgments about the behaviors of others.”

There is ample evidence that people with schizophrenia experience difficulties recognizing others' expressions, emotional states, and intentions (Green et al., 2015; Savla et al., 2013). Nonetheless, most patients understand the more general, explicit, or less cognitively demanding aspects of social interactions, implying a social cognitive heterogeneity in schizophrenia, with differences between low- and high-functioning individuals. This view seems confirmed by Etchepare et al. (2019) who, using a wide range of social cognitive measures and a cluster-analytic approach, found that nearly half of their sample had high (normal) functioning and Vaskinn et al. (2022) who found that patients with severe social cognitive impairments, nearly one third in their study, also show significant differences in functioning, symptomatology and nonsocial cognition.

Besides the heterogeneity in social functioning in schizophrenia, there is also less information on specific problems in perceiving and understanding social interactions. Nevertheless, in a meta-analysis of deficits in different domains of social cognition compared to controls, Savla et al. (2013) found a large effect size for social perception, theory of mind, emotion perception, and emotion processing. Nikolaides et al. (2016) investigated gaze behavior in schizophrenia in relation to social interactions and its impact on social and role functioning. When looking at social interaction scenes, patients showed a shorter scan path length, fewer fixations, and a shorter mean distance between fixations. In addition, they showed fewer and shorter fixations on faces, but not on socially informative bodies or in the background, suggesting a cue-specific abnormality. Using a similar task, Sergi and Green (2003) suggested that social perception in schizophrenia is related to very early aspects of visual processing, although their results were strongly influenced by educational level.

Kitoko et al. (2020) assessed both social perception and social knowledge using the PerSo test. Patients with schizophrenia had reduced performance in contextual fluency, interpretation and social convention. These deficits did not correlate with the severity of clinical symptoms, and analyses of individual profiles showed marked heterogeneity among patients in their abilities. Karpouzian et al. (2016) used a facial affect perception task and single-person video scenes showing different facial expressions, voice intonations, and body gestures to assess social perception among individuals with schizophrenia and concluded that high-functioning individuals retain social perception while low-functioning individuals do not. Lee et al. (2013) reported that people with schizophrenia can use available social contextual information to identify ambiguous facial expressions. In another investigation (Cavieres et al., 2020), a group of patients used the same type of information as controls to make sense of a social situation, arriving at similar interpretations.

Sergi et al. (2009) stated that most studies assess how people with schizophrenia understand and make inferences about other individuals, typically by perceiving social cues such as facial expressions or gestures. However, they claim, relationship perception, the ability to implicitly recognize how others are organizing their behavior in a given social interaction, and to understand the implications of using that particular relational model, has been less studied. Using The Relationships Across Domains (RAD) test in order to measure the degree of competence in relationship perception, Green et al. (2012) detected impairments in people with schizophrenia across all phases of the illness.

In our own view, we have argued that clinical data suggest that people with schizophrenia have problems perceiving social situations as opportunities for social engagement with and between others (Cavieres and López-Silva, 2022). We hypothesize that this difficulty may manifest itself even before recognizing the type of interaction, as a possible impediment to perceiving social interactions between other people. Seeking to add to the still insufficient information about deficits in social perception in people with schizophrenia, we present data obtained using an ad-hoc task designed to compare their ability to identify and describe

social interactions with the responses from a group of people with bipolar disorder and from a general population control group. We included people with bipolar disorder because a recent metaanalysis (Gillissie et al., 2022) found that patients with this condition present deficits in several aspects of social cognition, with a small to moderate effect size for social judgment and decision-making. We anticipate that people with schizophrenia will have minor difficulties describing the more explicit and concrete elements of social interactions (context, participants) but will perform more poorly in identifying and describing the interactions themselves. We also expect the group of people with bipolar disorder to have intermediate results between the schizophrenia and the control group.

## 2. Methods

### 2.1. Participants

The sample consisted of 90 participants aged 18–65 years, including both sexes. Of the 90 participants, 30 had a diagnosis of schizophrenia (DSM-5), and 30 had a diagnosis of bipolar disorder with psychotic features (DSM-5), all 60 of whom were stabilized in their clinical condition and were in outpatient treatment at the Hospital del Salvador in Valparaíso, Chile; the remaining 30 participants were healthy controls recruited from the community with no self-report of past or current psychiatric disorders, and no first-degree relative with a psychiatric disorder (Table 1).

Based on the study by Kitoko et al. (2020), a sample size of 30 participants per group was estimated, considering a 5 % significance and a statistical power of 90 %. Individuals who had difficulties understanding or performing the requested tasks or who had severe medical or neurological illnesses or substance use disorders were not included in the study. All participants gave their written informed consent. The study protocol and procedures were approved by the Ethics Review Board of the Valparaíso-San Antonio Health Service.

### 2.2. Procedures

The neurocognitive functioning of all participants was assessed with

**Table 1**  
Descriptive characteristics of the sample.

	HC group (n = 30)	BD group (n = 30)	SZ group (n = 30)	p
Sex (female)	35.2 % (n = 18)	66.6 % (n = 20)	25.4 % (n = 13)	.171
Age (SD)	35.7 years (±2.2)	39.2 years (±2.3)	37.2 years (±1.5)	.175
Educational level (bachelor)	96.6 % (n = 29)	63.3 % (n = 19)	13.3 % (n = 4)	<.001
Context (SD) †	27.7 (±1.2)	20.9 (±1.3)	18.5 (±1.3)	<.001
People (SD) ††	31.9 (±0.7)	28.3 (±1)	18.7 (±1.9)	<.001
Interaction (SD) †††	22.7 (±0.9)	20 (±0.9)	15 (±0.9)	<.001
VLT-I (SD)	21.9 (±0.6)	18.5 (±0.83)	15.9 (±0.7)	<.001
WMT (SD)	19.9 (±0.6)	17 (±0.6)	15.9 (±0.5)	<.001
VFT (SD)	21.3 (±0.68)	17.7 (±0.9)	10.5 (±0.6)	<.001
VLT-D (SD)	6.7 (±0.4)	5.5 (±0.3)	3.9 (±0.4)	<.001
PST (SD)	12.4 (±0.5)	10.3 (±0.5)	7.1 (±0.4)	<.001
SCIP TS (SD)	82.3 (±1.8)	69.2 (±2.6)	53.5 (±1.5)	<.001
BPRS TS (SD)		26.8 (±5.7)	19.2 (±2.8)	<.001

\*HC: healthy controls; BD: bipolar disorder; SZ: schizophrenia; SD: standard deviation; VLT-I: verbal learning test-immediate; WMT: working memory test; VFT: verbal fluency test; VLT-D: verbal learning test-delayed; PST: processing speed test; SCIP TS: Screen for Cognitive Impairment in Psychiatry Scale total score; BPRS TS: Brief Psychiatric Rating Scale total score; † Groups with statistically significant difference: HC-BD ( $p = .002$ ) and HC-SZ ( $p < .001$ ); †† Groups with statistically significant difference: HC-SZ ( $p < .001$ ) and BD-SZ ( $p < .001$ ); ††† Groups with statistically significant difference: HC-SZ ( $p < .001$ ) and BD-SZ ( $p = .001$ ).

the Screen for Cognitive Impairment in Psychiatry (SCIP) (Gómez-Benito et al., 2018). The SCIP consists of a single page with five subtests of cognitive skill (working memory, immediate and delayed verbal list learning, verbal fluency, and psychomotor speed) that can be completed with a pencil and a timer with a total administration time of approximately 15 min. All patients were additionally evaluated by a psychiatrist using the Brief Psychiatric Rating Scale (BPRS) (Overall and Gorham, 1962).

In the experimental task, 18 scenes taken from the Social Information Preference Test (Bland et al., 2016) were displayed in random order on a computer screen. We selected these images because we have used these images in previous research (Cavieres et al., 2020), and found that people with schizophrenia completed the requested tasks without any problems. The scenes are static drawings of people interacting with each other in various common social situations. The participants were instructed to describe the scene freely, with no time limits. Prior to each scene, the investigator repeated a single instruction: "What do you think is happening in the scene?" All responses were recorded and transcribed and given to three psychologists who acted as raters, independent of each other. All were blinded to the diagnosis and identity of the subjects and were asked to assign a separate score for each item based on the degree to which the description identified a) the social context, b) the participants of the scene, and c) the interaction depicted. They were instructed to assign a score of 0 (absent), when no mention was made of the element, or 2 (present) when a full identification and description of the element was provided, incomplete responses were rated as 1 (partial). After each evaluator submitted his or her scores, these were averaged, providing a final result.

### 2.3. Statistical analysis

Proportions and means (standard deviation) were used for descriptive analysis. In the inferential analysis, a significance level of 5 % was used. Pearson's chi-square test was used to compare proportions. Student's *t*-test and one-way ANOVA, with post hoc group comparisons through the Bonferroni correction test, were used to compare means. Pearson's correlation test was applied to examine the relationship between social perception and neurocognitive functioning. Finally, three

ANCOVA were used to examine the effect of diagnosis (HC, BD, or SZ) and cognitive performance (SCIP total score) as a covariate on each dimension of social perception (context, people, and interaction). A linear relationship, homoscedasticity, normality of residuals, and slope homogeneity assumptions were tested for ANCOVA.

### 3. Results

The results show differences in the performance of the three groups. For the item regarding the context of the scenes, the SZ and BD groups scored significantly lower than the HC group (Fig. 1), with no significant difference between the SZ and BD groups. Regarding the identification of the people and interactions depicted in the scenes, the SZ group identified significantly fewer elements than the HC and BD groups, with no significant difference between the HC and BD groups (Figs. 1 and 2 and Table 1).

When considering cognitive performance as a covariate, the diagnostic category had a significant effect on context ( $p = .001$ ), and people ( $p = .0001$ ), but not on interaction ( $p = .08$ ) (Table 2 and Fig. 3). Cognitive performance had a significant effect on interaction ( $p = .008$ ), but not on context ( $p = .88$ ) or people ( $p = .62$ ). Adjusted R<sup>2</sup> for context, people, and interaction ANCOVA were 0.20, 0.33, and 0.30, respectively. In Table 3, we describe the crude and SCIP TS-adjusted score for each dimension of social perception by groups. In contrast to context and people scores, SCIP TS had a significant effect on interaction scores as verified by ANCOVA.

### 4. Discussion

Rather than the extensively studied emotion perception, recognition impairments, or the difficulties of understanding explicit factual information from social situations, we focused our research on the specific ability to perceive other people interacting with each other. We have previously hypothesized this as a low-level pre-reflective process underlying the awareness of interpersonal interactions with and between others (Cavieres and López-Silva, 2022) even before understanding them.

Our main hypothesis, that people with schizophrenia would show

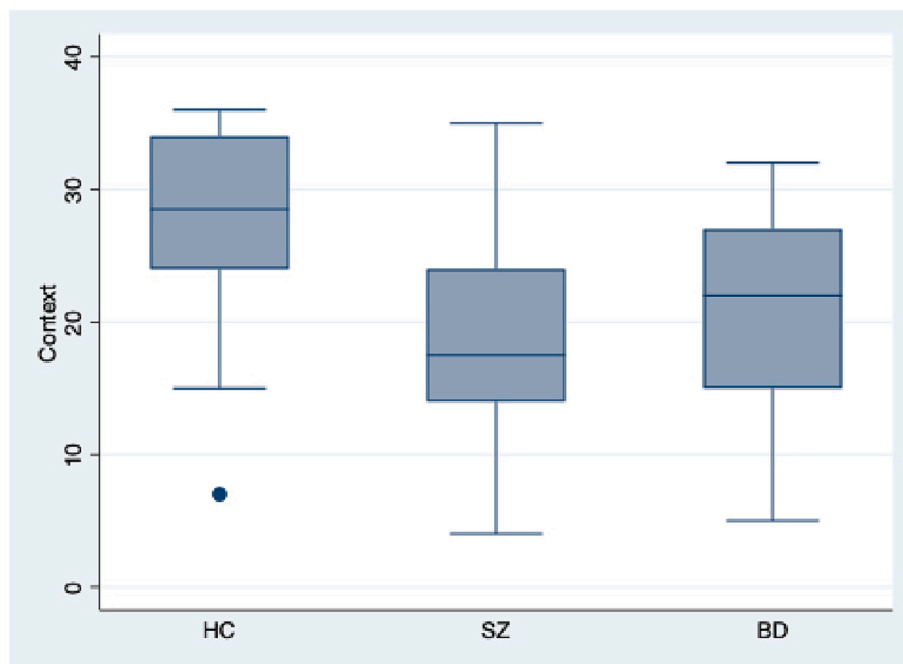


Fig. 1. Context scores by group.  
HC: healthy controls; SZ: schizophrenia; BD: bipolar disorder.

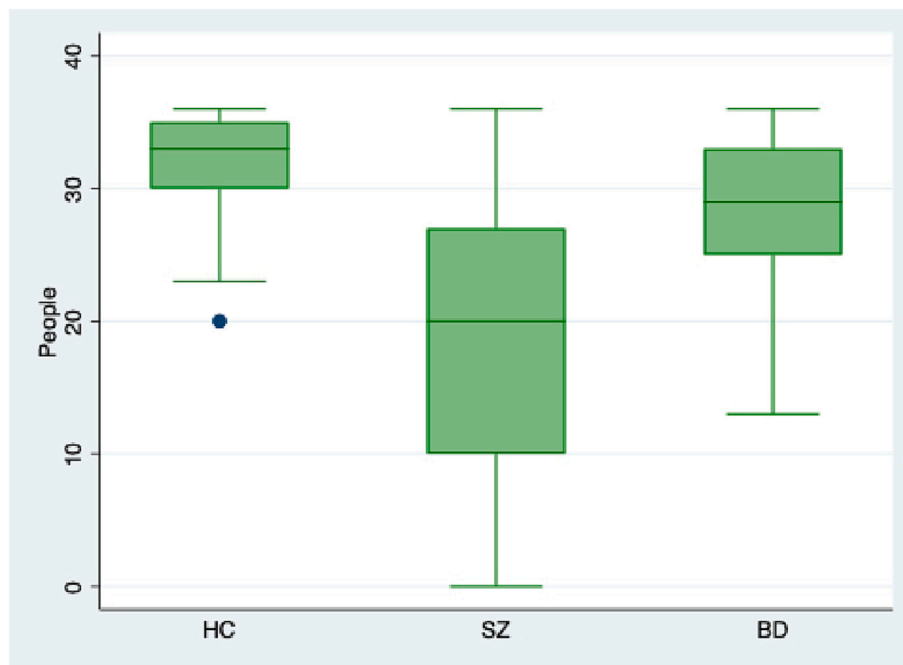


Fig. 2. People scores by group.  
 HC: healthy controls; SZ: schizophrenia; BD: bipolar disorder.

**Table 2**  
 Correlation among context, people, interaction and neurocognition (correlation coefficient).

	1	2	3	4	5	6	7	8	9
1. Context									
2. People	0.528***								
3. Interaction	0.471***	0.699***							
4. VLT-I	0.229*	0.360***	0.398***						
5. WMT	0.232*	0.369***	0.468***	0.549***					
6. VFT	0.262*	0.395***	0.435***	0.464***	0.546***				
7. VLT-D	0.240*	0.252*	0.282**	0.654***	0.356***	0.357***			
8. PST	0.270*	0.338**	0.476***	0.635***	0.451***	0.568***	0.471***		
9. SCIP TS	0.316**	0.452***	0.536***	0.831***	0.751***	0.819***	0.665***	0.793***	

VLT-I: verbal learning test-immediate; WMT: working memory test; VFT: verbal fluency test; VLT-D: verbal learning test-delayed; PST: processing speed test; SCIP TS: Screen for Cognitive Impairment in Psychiatry Scale total score; \* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

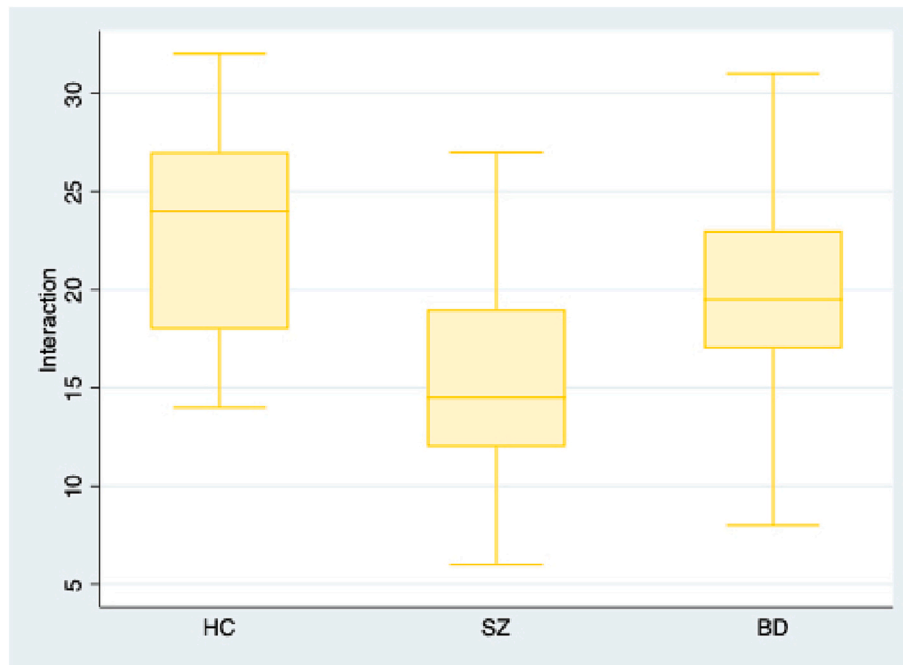
difficulties perceiving interactions occurring in a social situation, is confirmed by the results of the present study but less anticipated; they also exhibited difficulties describing the contextual elements and the people involved. For the items related to people and interactions, participants with schizophrenia showed significant differences compared to participants with bipolar disorder, who showed no significant differences from the control group. This finding may imply the presence of a deficit specific to schizophrenia that may possibly be related to the poorer psychosocial functioning of individuals with this diagnosis.

In addition to previous research that focused on the understanding of social interactions (Corrigan, 1997; Sergi et al., 2009), our results show that people with schizophrenia have difficulties perceiving these interactions. Due to the association found between the SCIP score and the scores on the scenes, we cannot dismiss that the ability to report these interactions depends on cognitive performance. However, it is important to note that participants were not asked to describe what the people in the scene were doing—which implies understanding the pragmatic aspects of the situation and hence is more dependent on cognitive functioning—but simply “what is happening in the scene?” which is a much more ended and less demanding question.

The results from the BD group were somewhat expected. While a recent meta-analysis reported clinically significant deficits in social cognition during euthymic and symptomatic phases (Gillissie et al.,

2022), a previous publication (Bora and Pantelis, 2016) reported a less severe impairment in comparison to schizophrenia, although between-group differences were modest with significant overlap in performance. Similar to schizophrenia, heterogeneity has also been found among BD patients. A cluster analysis (Szmulewicz et al., 2020) found that 70 % of patients performed as well as healthy controls in basic emotion recognition tasks. Most studies classify social cognitive domains according to the NIMH workshop (Green et al., 2008), but no recommendation has been made regarding the most suitable tasks for the assessment of attributional bias, social perception, and social knowledge in people with BD, with very few, if any, study focusing on the last two domains (Rotenberg et al., 2022).

Our results are compatible with the description of two distinct neural systems active during the processing of social information: the “mirror neuron system” (MNS) and the “mentalizing” system (MENT). Both systems are activated during interaction or communication with other human beings in social encounters (Bickart et al., 2014; Porcelli et al., 2019; Vogeley, 2017). Although their precise functional roles are still unclear, it seems that the MNS is involved in the early stages of social information processing related to the “detection” of spatial or bodily signals, whereas the MENT is recruited during later stages related to the “evaluation” of emotional and psychological states of others (Geiger et al., 2019; Vogeley, 2017). Using videotaped scenes containing facial



**Fig. 3.** Interaction scores by group. HC: healthy controls; SZ: schizophrenia; BD: bipolar disorder.

**Table 3**  
Crude and SCIP TS-adjusted scores of dimensions of social perception by group.

Dimension of social perception		HC group (n = 30)	BD group (n = 30)	SZ group (n = 30)
Context	Crude score	27.7 (±1.2)	20.9 (±1.3)	18.5 (±1.3)
	SCIP TS-adjusted score	27.8 (±1.6)	20.9 (±1.3)	18.4 (±1.6)
People	Crude score	31.9 (±0.7)	28.3 (±1)	18.7 (±1.9)
	SCIP TS-adjusted score	31.4 (±1.7)	28.3 (±1.3)	19.2 (±1.7)
Interaction	Crude score	22.7 (±0.9)	20 (±0.9)	15 (±0.9)
	SCIP TS-adjusted score	20.9 (±1.1)	19.9 (±0.93)	16.9 (±1.1)

expressions, voice intonations and bodily gestures of a Caucasian female [Sergi et al. \(2006\)](#) found that social perception in schizophrenia is related to very early aspects of visual processing.

Our research is exploratory and has several limitations. First, this design does not allow us to distinguish between what is perceived and what is described by the participants. Even though the required task was extremely simple and easy to execute, the patients—especially those with schizophrenia—may still have been limited by motivational, linguistic, and cognitive difficulties. Second, since our interest was to explore the existence of a previously unstudied deficit in social cognition, we did not separately evaluate other skills that could influence the results, such as facial emotion recognition or theory of mind. Nevertheless, the results show difficulty in perceiving different elements (context, people, and interactions) that make up a social situation. Finally, in the future, it seems important to evaluate the relationship with symptomatic aspects of the disease, such as psychotic and negative symptoms, the functional repercussion of the described deficit, and rehabilitation possibilities.

### 5. Conclusions

The results of this research seem to confirm that, in addition to previously described deficits in social cognition, people with schizophrenia also experience difficulties perceiving the interpersonal affordances of social encounters. This could lead to the inability to generate an adequate intersubjective space in which to share and construct meanings about everyday life experiences, including the use of pragmatic language, leaving subjects vulnerable to the emergence of idiosyncratic and self-referential interpretations that might produce psychotic symptoms ([Cavieres and López-Silva, 2022](#)).

### CRedit authorship contribution statement

- Alvaro Cavieres Fernandez: A,B,C,D,F,G.
- Vanessa Acuña Perez: C,E,F,G.
- Marcelo Arancibia Meza: C,D,F,I.
- Nicolas Lopetegui Lazo: B.
- A Conception and design of the work.
- B Collection/obtaining of results.
- C Analysis and interpretation of data.
- D Drafting of the manuscript.
- E Critical review of the manuscript.
- F Approval of the final version of the manuscript.
- G Contribution of patients or study material.
- I Statistical advice.

### Declaration of competing interest

None to declare.

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