



Nonverbal Communication and Alexithymia in Schizophrenia Patients

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RESUMEN

Introducción: la esquizofrenia se acompaña de déficits como alteraciones en la percepción social. La alexitimia, la incapacidad para expresar emociones o sentimientos, es un déficit comunicativo emocional común en la esquizofrenia. **Objetivo:** evaluar la capacidad de percepción de claves sociales, actitudes interpersonales y comunicación de intenciones por canales expresivos no verbales en pacientes con esquizofrenia frente a un grupo control. **Método:** se trata de un estudio transversal y comparativo (102 sujetos, de 18 a 45 años). El primer grupo estaba formado por 50 pacientes con esquizofrenia (48% hombres) según los criterios del DSM-5. El segundo grupo estaba formado por 52 sujetos (51.9% hombres) sin psicopatología ni antecedentes de trastornos mentales en familiares en primer grado, déficits neurológicos ni discapacidad intelectual. Se utilizó el MiniPONS para evaluar la percepción social y la escala TAS-20 para evaluar la alexitimia. Se utilizaron pruebas χ^2 y t de Student, y un análisis de varianza con dos factores (grupo-sexo) para las puntuaciones de MiniPONS y TAS. Se buscaron correlaciones entre MiniPONS, alexitimia y PANSS. **Resultados:** encontramos una correlación significativa entre educación y las puntuaciones MiniPONS y TAS en el grupo de esquizofrenia: $r = .36, p < .01$ y $r = -.46, p < .01$, pero no en el grupo control: $r = .17, p = .41$ y $r = -.08, p = .71$. El grupo con esquizofrenia obtuvo peores resultados en el MiniPONS: 39.90, $DE = 5.99$. **Discusión y conclusiones:** nuestros resultados muestran un peor rendimiento global en comunicación no verbal e identificación de afectos en el grupo de pacientes. Estos fallos ejemplifican la dificultad para comprender sus propias emociones.

Palabras clave: esquizofrenia, cognición social, alexitimia, comunicación no verbal.

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ABSTRACT

Introduction: schizophrenia is accompanied by deficits such as alterations in social perception. Alexithymia, the impairment to express emotions or feelings, is an emotional communicative deficit common to schizophrenia. **Objective:** to evaluate the ability to perceive social cues, interpersonal attitudes and the communication of intentions by nonverbal expressive channels in patients with schizophrenia when compared with a control group. **Method:** a cross-sectional, comparative study (102 subjects, aged 18 to 45). The first group consisted of 50 patients with schizophrenia, (48% men) according to DSM-5 criteria. The second group consisted of 52 subjects (51.9% men) without psychopathology or history of mental disorders in first degree relatives, neurological deficits and intellectual disabilities. MiniPONS was used to assess social perception and the TAS-20 scale was used to assess alexithymia. We used χ^2 and Student's *t* tests, and an analysis of variance of two factors (group-sex) was used for MiniPONS and TAS scores. We searched for correlations between MiniPONS, alexithymia and PANSS. **Results:** we found a significant correlation between education and MiniPONS and TAS scores in the schizophrenia group: $r = .36, p < .01$ and $r = -.46, p < .01$, but not in the control group: $r = .17, p = .41$ and $r = -.08, p = .71$. The schizophrenia group performed worse on the MiniPONS: 39.90, $SD = 5.99$. **Discussion and conclusions:** our results show a worse overall performance in nonverbal communication and affect identification in the patient group. These failures exemplify the difficulty of understanding their own emotions.

Keywords: schizophrenia, social cognition, alexithymia, nonverbal communication.

INTRODUCTION

Schizophrenia is a chronic and disabling disease with multiple symptoms, such as hallucinations, delusions, disorganized speech and behavior, apathy, abulia, neurocognitive impairment, social cognition and metacognition impairment (Hasson-Ohayon et al., 2018). The severity of these symptoms is associated in a semi-independent way with poor functionality in work, academic, and social areas, and with a decrease in the patients' autonomy (Grau et al., 2016; Langdon et al., 2014).

The challenge to establish and maintain appropriate social interactions is one of the impairments most closely linked with the poor psychosocial performance of this population. Previous research describes that this problem is the result of a social cognition process failure, which involves the mental operations that allows the patients to make representations about the relationships between the self and others, and the flexible use of these representations as a guide for social behavior; these mechanisms contribute to interpersonal bonding and to the adaptation to different social contexts (Adolphs, 2001; Javed & Charles, 2018). People with schizophrenia present impairments in different domains of social cognition, such as the theory of mind, social perception, emotional processing, and emotional perception (Savla et al., 2013).

Considering the primary failures in social information processing, it is to be expected that patients encounter more barriers to adjust their behavior to different social demands, and thus have a more restricted access to work activities, which further challenges them when trying to maintain an independent life since it decreases their autonomy (Green et al., 2015; Lepage et al., 2014; van Os & Kapur, 2009).

The social cognition domain involves different cognitive and affective processes, such as perception, codification, storage, recovery and regulation of the social information as well as knowledge on the intentions and beliefs from other people and themselves, perception of social signs, shared experiences, emotional manifestation and regulation (Green et al., 2015). It also involves the evaluation of social situations to create inferences out of all the social elements of the environment (Green et al., 2015; Rodríguez et al., 2013). Various theory proposals have raised the study of these processes, Couture & Penn (2013) describes four basic constructs for its study: social perception and knowledge; emotional processing; theory of mind, and the attribution style.

Within the primary processes, social perception (also called social knowledge or social scheme)

is understood as the ability to identify the components that characterize a given situation, meaning the actions, roles, rules, and goals that comprise a determined social situation (Billeke & Aboitiz, 2013). This is the frame of reference that allows a person to know how to act, to determine which are their and the others' roles in any given situation, to know which are the rules that are used and what are the reasons why one is involved in a particular social situation (Billeke & Aboitiz, 2013; Brekke et al., 2005). The construction of this frame of reference requires the adequate interpretation of verbal and nonverbal signs, the latter being an important object of study as they influence the rapid judgment, the first impressions about others, and therefore the resulting social interactions (Ambady et al., 2000; Lundberg, 2013; Zebrowitz, 1997).

Schizophrenia is also associated with alexithymia, an emotional communication deficit associated with operational thinking, high impulsivity, and copious bodily sensations (Gawęda & Krężolek, 2019; Bagby et al., 2020; Heshmati et al., 2011). This deficit involves difficulties to discriminate between feelings and bodily sensations, identifying and communicating or describing feelings, and a lack of fantasy and an externally oriented cognitive style (Alonso-Fernández, 2011; Bagby et al., 2020; Fogley et al., 2014; Gawęda & Krężolek, 2019; Heshmati et al., 2011; Kimhy et al., 2012; Kubota et al., 2011). This phenomenon is associated with a decrease of the interhemispheric communication that lowers the coordination and integration of specialized functions and determines an abnormal state of affective inhibition, which is observed in multiple pathologies. These two primary components of social cognition are considered essential for the social environment evaluation and its comprehension; its malfunction is associated with potential difficulties to understand the social world, due to the generation of misinterpretations and codification errors and difficulties in the evaluation and adjusting of behavior, which results in a failure of the inclusion in the social world (Lundberg, 2013). In patients with schizophrenia, both social cognition and alexithymia, in relation with emotional regulation and externalizing behavior, might contribute to aggressivity (Hsu & Ouyang, 2021). Alexithymia is not always present in schizophrenia patients, and it can accompany other conditions such as sleep, depression and anxiety disorders, among others (Üstündağ et al., 2020); in a study with non-psychotic population, alexithymia was found in 21.8% of college students (Famarzi & Khafri, 2017). The overlap between negative symp-

toms and alexithymia could lead to the symptoms being confused or not being identified, as well as to a common origin (Rahm et al., 2015; Yi et al., 2023).

Research on the relation between alexithymia and symptoms of schizophrenia shows a stronger association with negative symptoms (one of the main domains of schizophrenia psychopathology, characterized by associability, apathy and abulia, among other impairments) (Fogley et al., 2014; van't Wout et al., 2007). Hsu & Ouyang (2021) explain that alexithymia is related to aggressive behavior and violence in schizophrenia, in part because of emotional inexpressiveness and an inability to cope with stress; they found that an intervention focused on social cognition and emotional regulation in persons with schizophrenia could help reduce aggression, hostility, and alexithymia, among other features of aggressive behavior. This finding indicates that reducing aggression is a priority in both outpatient and inpatient settings (Pachi et al., 2022).

Other authors have found that alexithymia is independent from the disease's characteristic psychopathology; it has been reported that this deficit persists after improvements in negative symptoms, and that not all patients with schizophrenia have alexithymia (Fogley et al., 2014; Todarello et al., 2005; Üstündağ et al., 2020). The overlap of the clinical presentation of negative symptoms and alexithymia obscures the understanding of the latter; thus, some studies aim to distinguish between these constructs. Üstündağ et al. (2020) found that alexithymia behaves as a different construct, which correlates with lower functioning and worse clinical presentation. There is also a relationship, possibly bidirectional, with emotional distress, such as anxiety and depression (Fogley et al., 2014). As these authors suggest, alexithymia as a separate symptom dimension might account for the heterogeneity in clinical presentation and symptom severity. It's worth noting that alexithymia can be identified in approximately 10% of the general population and that research suggest a possible role as a risk factor for different psychiatric diagnoses and symptoms besides psychosis (Wang et al., 2022; Honkalampi et al., 2001).

Studies about emotion perception performance show differences between sexes, both in schizophrenia patients and in controls. In schizophrenia studies, female participants show better performance in anger perception; in a different study, women performed better than men in the identification of happiness and sadness in nonverbal channels; in verbal content tasks they did better than men in the identification of anger (Lin et al., 2023; Lin et al., 2021).

In control groups (non-clinical population), alexithymia associates with a higher risk of having psychotic experiences (Larøi et al., 2008). Research also shows an association between alexithymia and impaired memory, nonverbal intelligence, and declarative memory performance for words (Fogley et al., 2014; Terock et al., 2019). When compared to patients with either schizophrenia or bipolar disorder, healthy controls showed lower alexithymia levels (Ospina et al., 2019).

The evaluation of performance in social perception tasks of patients with schizophrenia and its correlation with alexithymia contributes to understanding the subject's ability to function in the social environment which, due to its usual demands, requires the ability to recognize emotions, social cues, nonverbal communication and a flexibility to adapt to specific contexts. Social cognition, the ability to identify social cues and emotions, contribute considerably to the formation and maintenance of some symptoms, such as delusions in the case of positive symptoms. In the case of negative symptoms, the relationship is more difficult to define due to the two-way interaction.

The objective of this study was to evaluate the performance in social perception tasks of schizophrenic patients, and then compare it with a control group, through nonverbal expression media, expression capacity performance, and verbalization of the emotional state. In a second analysis, we described the correlation between the social perception, alexithymia, and the main symptoms of schizophrenia (as categorized in the Positive and Negative Syndrome Scale [PANSS]: total, positive, negative, cognitive, excited and depression factors), with the clinical variables as well.

METHOD

Study Design and Participants

A comparative, transversal and observational study was carried out, in which 102 participants were evaluated divided into two groups.

The first group consisted of fifty outpatients (men and women) diagnosed with schizophrenia (EQ) according to DSM-5 criteria (American Psychiatric Association, 2013). This group ranged between 18 and 45 years, were clinically stable (PANSS total score < 90), and receiving pharmacological treatment at the time of assessment. All participants were recruited at the schizophrenia clinic of the National Institute of Psychiatry Ramón de la Fuente Muñiz

(INPRFM). The control group consisted of fifty-two (men and women) participants under the age of 45 with no mental disorder.

Instruments

The Positive and Negative Syndrome Scale (PANSS) was used to rate symptom severity (Fresán et al., 2005; Kay et al., 1987; Peralta & Cuesta, 1994). The PANSS is a widely used scale considered as the standard instrument for assessing patients with schizophrenia. It is a 30-item clinician-rated, semi-structured interview originally designed to obtain a measure of positive and negative symptoms in schizophrenic patients, as well as a measure of general psychopathology. Different studies have carried out factorial analyses of the scale and have found a cognitive factor composed of several items, which partly vary in the different analyses (Lehoux et al., 2009).

The five-factor model (Wallwork et al., 2012) for interpreting the PANSS, which is thought to be more representative of the syndromes of schizophrenia (Van den Oord et al., 2006) comprises positive, negative, disorganized/concrete, excited, and depressive factors. In Spanish speaking population, Cronbach's alpha for each factor were negative (.86); excited (.81); positive (.89); depressive (.80), and cognitive (.80) (Fresán et al., 2005).

The MiniPONS is a reduced (Mini) version of the Profile of Nonverbal Sensitivity (Rosenthal et al., 1979) was used to evaluate the social perception (Bänziger et al., 2011), in its Spanish adaptation by Martínez-Sánchez (Martínez-Sánchez et al., 2013). The MiniPONS assesses individual differences in social perception to detect emotions, interpersonal attitudes and intentions communicated through non-verbal expressive channels. This multichannel reduced version is composed by 64 nonverbal stimuli, in video or audio that includes four expressive channels and their combination: 16 black-and-white videos in which only the body of an actress appears, from the neck to the knees, without sound; 16 black-and-white videos in which the face of the same actress fills the screen, without sound; 16 emotional prosodic sounds, 8 of which had the voice filtered and the others distorted in some way; and 16 objects that combine video and prosody, and total score. The response procedure consists in asking the subject to select, between two possible options, which one is the relative right meaning of what the actress is expressing. The advantage of this adaptation relies in its length, which is approximately 15 minutes shorter than the original version, and in its implementation through a software tool which facilitates its application.

The Toronto Alexithymia Scale or TAS-20 (Bagby et al., 1994; Martínez-Sánchez, 1996) was used to evaluate alexithymia. The TAS-20 is a 20-item self-report measure of the alexithymia construct with good internal consistency (Cronbach's alpha = .78), high test-retest reliability ($r = .71; p < .001$), and construct and criterion validity. This questionnaire consists of 20 items (rated on 5-point scales) targeting the core dimensions of the construct: difficulty identifying and describing feelings, and externally oriented thinking. The stability and replicability of this factorial analysis have been systematically demonstrated in both clinical and non-clinical groups (Taylor et al., 2000).

The Mini International Neuropsychiatric Interview is a brief structured diagnostic interview. It explores the major psychiatric disorders of Axis I of the DSM-IV and ICD-10 for screening and/or diagnostic orientation. It is divided into 16 modules, identified by letters, each corresponding to a diagnostic category. Regarding the DSM-IV version, the kappa values for interobserver reliability are around .75, while test-retest reliability has been observed to be lower than .75 (Ferrando et al., 2000).

Procedures

Participants were invited to attend using flyers and posters placed in the waiting room of the schizophrenia clinic. Patients with substance abuse disorders, neurological deficits, or intellectual disability or with psychosis secondary to other health conditions were excluded. The group of patients were recruited from the outpatient schizophrenia clinic of the INPRFM in Mexico City, with evaluations performed by two qualified psychiatrists. The INPRFM is a specialized mental health center dedicated to research, education, and treatment of people with psychiatric disorders. The main researcher verified inclusion criteria. Once patients agreed to participate, the evaluations initiated with a clinical interview and the application of the Spanish version of the Toronto Alexithymia Scale (TAS-20) and MiniPONS, a reduced version of the Profile of Nonverbal Sensitivity (PONS).

The control group consisted of individuals' men and women from the general population of Mexico City. Recruitment was conducted by approaching potential participants in various public places near to the hospital (e.g., shopping malls, bus stations, parks, etc.). Those who agreed to participate were screened using the Mini International Neuropsychiatric Interview (Ferrando et al., 2000; Sheehan et al., 1998), and those who met the criteria for any diagnosis were excluded. Subjects who verbally reported a

history of psychiatric disorder, psychiatric hospitalization or treatment for substance abuse disorders, neurological deficits, or intellectual disability were also excluded.

Once participants in both groups were identified, they were invited to participate according to the procedure approved by the INPRFM ethics committee and had to sign the informed consent form. Instruments were applied by psychiatrist experts to both groups in the schizophrenia clinic of the INPRFM.

Data Analysis

Demographic variables between groups were analyzed by comparing means (*t*-tests) and chi-squared tests. A two-factor analysis of variance (cases and controls) was used for the MiniPONS and the TAS-20.

Finally, a Pearson correlation analysis was used between MiniPONS, alexithymia, PANSS scores, and the following clinical variables: age at onset, duration of untreated psychosis, number of previous episodes, number of psychiatric hospitalizations, and antipsychotic dosage in chlorpromazine equivalents. These variables are related to overall illness severity and prognosis.

Ethical Considerations

The study was approved by the INPRFM ethics committee (approval CEI/C/009/2015). The study pro-

cedures followed ethical and scientific principles for human research according to the Declaration of Helsinki (World Medical Association, 2013). This was a minimum risk study. All participants gave informed consent and all personal identification data was kept confidential.

RESULTS

The demographic and clinical characteristics of both groups are presented in Table 1. There were no significant differences for age ($t(100) = 1.45, p = .14$); academic years ($t(100) = -1.75, p = .08$), or sex ($\chi^2(1) = 1.33, p = .71$).

Differences between groups: patients with schizophrenia consistently showed poorer performance in the MiniPONS total score (patients $\bar{x} = 39.90, SD = 5.99$ vs controls $\bar{x} = 48.62, SD = 5.92$), and in the vocal prosody, facial expression, body gesture to the combination channels (Table 2). The same effect was registered in the TAS-20 score (patients $\bar{x} = 52.95, SD = 14.28$ vs controls $\bar{x} = 38.75, SD = 8.35$). None of the 2x2 variance analyses found a significant effect in sex factor (male vs. female) or in the interaction between sex and group ($F(1,48) = 3.28, p = .07$) (Table 2).

Correlations: a significant correlation was found between academic years and the MiniPONS ($r_p = .36, p < .01$) and TAS-20 ($r = -.46, p < .01$) score in the schizophrenia group, but not in the control group

Table 1

Mean and standard deviation subject characteristics for the patient and control groups

	Patients group	Control group
	N = 50	N = 52
	Mean (SD)	Mean (SD)
Age	39.90 (5.99)	48.62 (5.92)
Gender (male)	24 (48%)	27 (51.9%)
Education in years	10.20 (1.94)	12.35 (1.52)
CPZ equivalent	264 (123.73)	--
Illness duration in years	11.80 (5.3)	--
Hospitalization	1.27 (1.58)	--
PANSS general	75.48 (8.31)	--
PANSS positive	21.88 (3.53)	--
PANSS negative	21.50 (3.65)	--
PANSS cognitive	19.24 (2.76)	--
PANSS excited	4.72 (1.49)	--
PANSS depressed	7.70 (2.45)	--

Notes: SD = standard deviation; CPZ equivalent = chlorpromazine dose equivalent (mg/day). PANSS = Positive and Negative Syndrome Scale.

Table 2

Group comparisons on the MiniPONS and TAS-20 test using 2 x 2 analyses of variance

	Patients n = 50	Control n = 52	Group main effect (<i>F</i>)
	Mean (<i>SD</i>)	Mean (<i>SD</i>)	
MiniPONS total	39.90 (5.99)	48.62 (5.92)	50.52*
MiniPONS vocal prosody	9.52 (2.63)	11.85 (2.49)	20.68*
MiniPONS facial expression	10.20 (1.94)	12.35 (1.52)	35.41*
MiniPONS body gestures	9.96 (2.23)	11.83 (2.06)	18.50*
MiniPONS combined	10.22 (2.27)	12.60 (2.20)	24.14*
TAS F1	17.78 (6.38)	11.62 (4.27)	31.22*
TAS F2	14.10 (4.86)	10.52 (3.91)	14.66*
TAS F3	21.06 (5.64)	16.65 (3.97)	18.68*
TAS total	52.95 (14.28)	38.75 (8.35)	34.38*

Notes: * $p < .001$; SD = Standard Deviation; MiniPONS = Mini Profile of Nonverbal Sensitivity; TAS = Toronto Alexithymia Scale; F1 = Factor 1, F2 = Factor 2, F3 = Factor 3. As a second factor, no significant differences were found for sex.

($r_p = .17, p = .41$; $r_p = -.08, p = .71$). There were no significant correlations found between the MiniPONS, TAS-20, PANSS scores or clinical variables in the patient group (Table 3). Small correlations were observed between the Duration of Untreated Psychosis and the total PANSS score ($r_s = .37, p < .01$), the hospitalizations number and the factor 2 from the TAS-20 ($r_p = .28, p < .05$) and the prosodic punctuation and the chlorpromazine dosage ($r_p = -.27, p < .05$).

DISCUSSION AND CONCLUSIONS

This work's results indicate that patients with schizophrenia present a lower performance in tasks that require nonverbal sign identification, such as social communication elements, and that this performance differs considerably from participants without a schizophrenia diagnosis. This finding is consistent with previous reports from different authors (Riehle et al., 2018; Worswick et al., 2018). These failures are consistently reported and are associated with interaction impairments in the social context, as they require an affective synchronization between speech, posture, and body movements to acknowledge the rules of coexistence and adapt the conduct in order to successfully engage in a social interaction (Lavelle et al., 2013).

Patients with schizophrenia identify the affection expressions incorrectly and also report difficulties in monitoring their own emotional state and the ability to denominate and express those emotions, which was observed in their TAS-20 results. Our

findings are consistent with previous reports (Heshmati et al., 2011; Lysaker et al., 2017).

A relevant finding is the relationship between the years of academic studies and the MiniPONS scores in the schizophrenia group. A possible explanation rests on the hypothesis of cognitive reserve. It has been proposed that in psychiatric disorders, as in dementia models, brain reserve implies a capacity retained by a large part of the resources of cerebral plasticity, which allows the individual to face complex tasks more efficiently, even in the presence of pathology or brain damage. In psychiatric disorders, the "active model of the cognitive reserve" is a proposed model in which the participants with mental illness show a better functional adjustment if they previously had an average or higher than the average intellectual coefficient, a higher-level education, or a permanent work activity prior to the manifestation of the condition (Barnett et al., 2006).

Buonocore et al. (2018) document an existing relationship between cognitive reserve and social cognition in schizophrenia after analyzing the profiles of the patient's premorbid intellectual coefficient and previous functioning, with the scores obtained in tests of the theory of mind. The authors conclude that a greater cognitive reserve is associated with better performance in social cognition tasks, such as mentalization. Although it is not the same construct measured in our study, it is worth noting the preserved plastic capacities and their influence on the processing of complex information, such as the analysis of social situations. Another hypothesis implies that failures in social perception may be re-

Table 3
Pearson correlation analysis

	Age	EI	DP	NC	NH	DC	PAT	PAP	PAN	PAC	PAE	PAD	POT	POP	POC	POR	POB	TF1	TF2	TF3	
EI	.55***																				
DP	.11	-.12																			
NC	.31*	-.07	.14																		
NH	-.08	-.19	-.07	.00																	
DC	-.11	-.11	.02	.05	.05																
PAT	.08	-.15	.37**	.25	-.08	.13															
PAP	.09	-.14	.23	.20	-.13	.21	.79***														
PAN	-.01	-.07	.30*	.20	1.12	.09	.78***	.49***													
PAC	.18	-.09	.35*	.17	-.10	.18	.64***	.46**	.44**												
PAE	-.02	.07	-.21	-.25	.26	-.04	-.18*	-.23	-.19	-.31*											
PAD	-.11	-.14	.07	.00	-.23	-.13	.35	.02	.15	-.05	.30										
POT	-.02	.11	-.25	-.03	.14	-.19	-.10	-.19	-.05	-.07	.04	.05									
POP	.06	.26	-.27	.01	.19	-.27*	-.05	-.20	-.06	-.09	.24	.03	.77***								
POC	-.03	.09	-.26	-.06	.13	.05	-.23	-.20	-.05	-.13	-.17	-.17	.80***	.42***							
POR	.05	.07	.04	.11	.09	-.10	-.13	-.01	.04	.19	-.02	.15	.72***	.41***	.49***						
POB	-.17	-.15	-.15	-.15	-.05	-.16	-.10	.06	-.06	-.12	.02	.15	.72***	.36***	.46***	.38***					
TF1	.00	-.19	-.11	-.06	.14	.25	-.20	-.02	-.23	-.13	-.02	-.22	-.48***	-.42***	-.27**	-.45***	-.33**				
TF2	-.02	-.09	-.11	-.07	.28*	.05	-.20	-.16	-.25	-.13	.14	.02	-.42***	-.30**	-.26**	-.43***	-.32**	.64***			
TF3	.08	-.09	.08	.10	.06	.20	.03	.17	-.02	.09	-.08	-.19	-.46***	-.42***	-.33**	-.34***	-.29**	.57***	.39***		
TT	.02	-.15	-.05	-.01	.19	.21	-.14	.00	-.206	-.06	.00	-.17	-.55***	-.46***	-.34***	-.49***	-.38***	.90***	.79***	.79***	

Notes: EI = age of onset of psychosis; DP = duration of untreated psychosis; NC = number of untreated psychotic pictures; NH = number of previous psychotic pictures; DC = equivalent dose of chlorpromazine; PAT = total score on the PANSS scale; PAP = positive scale score; PAN = negative scale score; PAC = cognitive scale score; PAE = scale score for excitability; PAD = depression scale score; POT = total score on the MiniPONS scale; POP = prosody score; POC = combined score; POR = face score; POB = body score; TF1 = difficulty identifying emotions; TF2 = difficulty expressing emotions; TF3 = thought oriented to the external; TT = total score of ataxithymia; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

lated to the onset of the pathology and the isolation observed in these patients: by decreasing the social interactions offered by school or work education, patients could find a contextual limitation for the practice of identifying nonverbal components in peers in the context of high social demand. Future studies on cognitive reserve, contextual interventions and clinical variables are required for a definitive conclusion (Langdon et al., 2014).

A positive correlation was found, albeit weak, between the factor 2 of the alexithymia scale (difficulty expressing emotions), and the number of hospitalizations. It has been reported that the ability to describe emotions is associated with the ability to regulate them, which in turn can influence communication and social interaction, so that a impaired expression of emotions would slow down the outpatient interventions necessary to prevent hospitalization; 35% of the social functioning variance has been attributed to difficulties in describing emotions, a lower functionality is also associated with a worse evolution and therefore a greater number of relapses and hospitalizations (Kimhy et al., 2012). The positive correlation between the total PANSS score and the duration of untreated psychosis (DUP) was expected. The effect of a prolonged DUP is associated with more severe psychopathology, a greater number of hospitalizations and, in general, a worse prognosis. No correlations were found between the DUP and the results of the MiniPONS or the TAS scale, which leads to the assumption that alexithymia and perception are independent to the deterioration associated with prolonged DUP (Díaz-Caneja et al., 2015).

A weak but negative correlation between the scores of the MiniPONS and the doses of antipsychotics (chlorpromazine equivalents) shows the most severely ill patients, so they require higher doses to achieve stability. These same participants scored lower on the MiniPONS prosody subtest without it being considered an effect of antipsychotics, thus we infer that the greater severity of the disease affects the recognition of verbal forms and their semantic tones within social contexts (Kucharska-Pietura & Mortimer, 2013; Lin et al., 2018).

The final point of this study is the consideration of the clear distinction between the cluster of symptoms observed in patients with schizophrenia. No correlation was found between the scores obtained in positive, negative, or cognitive symptoms measured with the PANSS, and the subprocesses in the domain of social cognition. All this leads us to argue that although these are phenomena that occur simultaneously in patients, they are clearly distinguishable

processes that can have a differential impact on the functionality of patients. This adds to the data and approach presented by the work of Hasson-Ohayon and his team (Fogley et al., 2014; Grau et al., 2016; Hasson-Ohayon et al., 2018; Langdon et al., 2014). It is worth noting that other investigations have found different associations between specific symptom domains and alexithymia; Todarello et al. (2005) found no association with negative symptoms and report that alexithymia persists over time, regardless of the state of the negative symptoms. Gawęda & Krężolek (2019) did find an association between alexithymia and the severity of hallucinations, and they also found that in subjects with a longer history of psychotic symptoms the alexithymia scores were higher.

It has been argued that there is an association between the results of the TAS-20 and the negative symptoms of schizophrenia, considering that there is a close relation between negative symptoms, like alogia and blunt affect, and the efficiency of emotion awareness, description, identification, and expression (Fogley et al., 2014; Tang et al., 2016). Some authors do report an association between the negative and depression domains with the presence of alexithymia, which suggests the need for additional studies (Stanghellini & Ricca, 1995; van't Wout et al., 2007).

This study had the following limitations: cognitive evaluations were not included, while other works have explored the relationship between social cognition, alexithymia and cognitive functioning using specific cognitive batteries (Fogley et al., 2014; Gawęda & Krężolek, 2019), for example, Fogley et al. (2014) found that a higher cognitive impairment associated with higher alexithymia could affect the effectiveness of psychotherapeutic interventions. Due to a possible bidirectional relationship, the study of the interactions of alexithymia could assist in the understanding of the diverse impairments and symptoms common to patients with schizophrenia, and thus contribute to the improvement of treatment.

Although the TAS-20 has been validated and used in other studies, it is a self-report instrument, and so its results might be affected by desirability and complacency bias; other authors suggest using complementary instruments to reduce the impact of such biases (Fogley et al., 2014; Gawęda & Krężolek, 2019; Li et al., 2015).

Finally, in addition to a larger sample, this study could benefit from a longitudinal design with long term follow up of participants to improve the understanding of causality and association with the construct.

Research shows there is a consistent deficit in social cognition, social perception, and emotional expression in subjects with schizophrenia, although additional investigations are required to explore the correlations reported in the literature. As previously discussed, our finding of an absence of correlations with clinical variables supports the existence of the alexithymia construct as an independent mechanism, which could function as a mediator or regulator of psychopathology, more as part of a network than as an etiological mechanism.

This implies that the improvement of psychopathology by interventions such as antipsychotic treatment would not necessarily improve the mediating mechanism, thus requiring other specific interventions. Alexithymia, as it appears to be a discrete symptomatic dimension, might be targeted with interventions such as social skills training and cognitive behavioral treatments (as the emotion recognition and expression program and the integrated cognitive based violence intervention program). Specific trials are few and small in size, thus further research is required in population with schizophrenia (Üstündağ et al., 2020; Aydın et al., 2024; Aghotor et al., 2010; Gawęda & Kręzolek, 2019; Hsu & Ouyang, 2021).

This study could benefit of methodological modifications that allow the exploration of the conclusions of other works; the identification of alexithymia's role as a risk factor for psychotic disorders (among other psychiatric conditions) and as a therapeutic target is of particular interest, as it appears that alexithymia functions as another component of the already heterogeneous symptomatology of schizophrenia.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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