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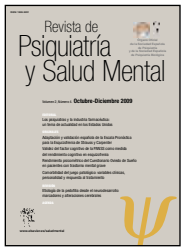

ORIGINAL

Validity of the PANSS cognitive factor as a measurement of cognitive performance in schizophrenia

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Abstract
Introduction: The Positive and Negative Syndrome Scale (PANSS) is a widely used instrument for measuring symptomatology in patients with schizophrenia. Numerous studies have analyzed the factorial structure of this scale and have suggested a five factor model, namely: negative, positive, excited, anxiety/depression, and disorganized (or cognitive). The latter factor has been related to neuropsychological tests, with a view to analyzing its utility as a measure of cognitive functioning in schizophrenia, but data are inconclusive. The aim of the present study was to analyze the factorial structure of the PANSS and to assess the relationships between factors and neurocognitive tests.
Material and methods: The sample comprised 235 outpatients diagnosed with schizophrenia. To investigate the factorial structure of the PANSS, a principal component factor analysis was performed. Cognitive functioning was measured with a shortened version of the Barcelona Test.
Results: Unlike previous studies, our study obtained a six-factor model, with disorganized and cognitive symptoms separated in two different factors. The cognitive factor obtained in this study was related to all subtests of the Barcelona Test. The disorganized factor, however, was only related to two of these subtests.
Conclusions: Our results support the use of a six-factor model and suggest that the cognitive factor could be a valid measure of cognitive deficits in schizophrenia, although the use of a standard neuropsychological battery is advisable.

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PALABRAS CLAVE
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Validez del factor cognitive de la PANSS como medida del rendimiento cognitive en esquizofrenia

Resumen
Introducción: La Escala de los Síndromes Positivo y Negativo (PANSS) es uno de los instrumentos más utilizados para valorar la sintomatología de los pacientes con esquizofrenia. Numerosos estudios han analizado la estructura factorial de esta escala, y han propuesto la existencia de cinco factores: negativo, positivo, excitación, ansiedad/depresión y desorganización (o cognitivo). Este último factor se ha relacionado con pruebas neuropsicológicas con la finalidad de analizar su utilidad como medida del rendimiento cognitivo en esquizofrenia, aunque no se han obtenido resultados concluyentes. El objetivo del presente estudio es analizar la estructura de la PANSS y relacionar los factores obtenidos con pruebas cognitivas.
Material y métodos: La muestra del estudio está compuesta por 235 pacientes, diagnosticados de esquizofrenia, que viven en la comunidad. La estructura de la PANSS se valoró mediante un análisis factorial de componentes principales. Para evaluar el rendimiento cognitivo se utilizó una versión reducida del Test Barcelona.
Resultados: A diferencia de estudios previos, se obtuvieron seis factores principales, ya que se separó el factor desorganización/cognitivo en dos factores distintos. El factor cognitivo obtenido en el estudio correlacionó con todos los subtests del Test Barcelona, mientras que el factor desorganización sólo lo hizo con dos de esos subtests.
Conclusiones: Los resultados obtenidos recomiendan utilizar un modelo factorial de seis factores, e indican que el factor cognitivo de la PANSS puede usarse como medida del rendimiento cognitivo en esquizofrenia, si bien es aconsejable realizar una evaluación neuropsicológica más amplia.

Introduction

The Positive and Negative Syndrome Scale (PANSS), developed by Kay et al[1] in 1987 and adapted in Spanish by Peralta et al[2] in 1994, is one of the most commonly-used instruments for evaluating symptomatology in schizophrenic patients. This interviewer-administered rating is filled in based on a semi-structured interview which lasts about 45 minutes. In its original version, the PANSS contained 30 items which were grouped by three factors: the positive scale (containing seven items), the negative scale (also with seven items) and general psychopathology (containing 16 items). However, the creators of the scale had their doubts about the usefulness of these three factors for properly organising the symptoms evaluated by PANSS, and in a later study, they proposed four factors: negative scale, positive scale, agitation-excitement and depressive symptoms.[3] In 1997, the PANSS study group analysed the scale's factorial structure and concluded that a five-factor model would best represent the dimensions included in the PANSS. This new model, called the pentagonal model, is composed of the following scales: negative, positive, activation, dysphoric mood and autistic preoccupations.[4] This model was included in the revised PANSS manual published in 2000.[5]

Nevertheless, subsequent investigations have not confirmed that the pentagonal model offers an adequate representation of the symptoms characterising schizophrenia.[6] Rather, most of the studies that have been carried out propose a model different from White et al's[4] which maintains the five-factor structure. Although there is no unanimous agreement in the literature, the most widely-accepted model is composed of the following scales: negative, positive, excitement (sometimes called hostility), anxiety/depression (in some studies, emotional distress) and disorganisation/cognitive factors. This model has been tested in both patients with a long history of the disease and patients in early stages.[7-20] Table 1 displays some of the proposed models, as well as the items that make up the five factors outlined in each of these models. As we can see in the table, some models use all 30 items in the PANSS, while others exclude certain items from the final model. In general, there are two criteria for not including a specific item: significant factor loading not being achieved for any factor (load lower than 0.35 or 0.55 depending on the study), or an item having significant factor loading for more than one factor. One example of this is the study carried out by Van der Gaag et al,[19,20] who carried out a PANSS analysis that developed a double model with five factors. The first model included the 30 items that make up the PANSS, although several items belong to more than one factor. The second, composed by 25 items, included only those items that represent a single factor.

As we see in table 1, some items consistently belong to a single separate PANSS factor in all of the proposed models. Other items, however, are not so consistent,

Table 1 Factor models for PANSS and items making up each factor

Items in PANSS	Bell et al (1994)	Lançon et al (1998)	Lykouras et al (2000)	Mass et al (2000)	Wolthaus et al (2000)	Whitehorn et al (2002)	Emsley et al (2003)	Klingberg et al (2006)	Van der Gaag et al (2006)	
									A	B
P1. Delusions	2	2	2	2	2	2	2	2	2	2
P2. Conceptual disorganisation	5	2	5	5	5	5	5	5	1	5
P3. Hallucinatory behaviour	2	2	2	2	2	2	2	2	2	2
P4. Excitement	3	3	3	3	3	3	3	Exc	3	3
P5. Grandiosity	2	2	2	3	2	2	2	Exc	2/3	2
P6. Suspiciousness	2	2	2	Exc	2	2	2	2	2/4	2
P7. Hostility	3	3	3	3	3	3	3	3	3	3
N1. Blunted affect	1	1	1	1	1	1	1	1	1	1
N2. Emotional withdrawal	1	1	1	1	1	1	1	1	1	1
N3. Poor rapport	1	1	1	1	1	1	1	1	1/3	1
N4. Social withdrawal	1	1	1	1	1	1	1	1	1	1
N5. Difficulty in abstract thinking	5	5	5	5	5	5	5	5	1/2	5
N6. Lack of spontaneity and flow of conversation	1	1	1	1	1	1	1	1	1	1
N7. Stereotyped thinking	5	Exc	5	Exc	5	5	5	5	5	5
G1. Somatic concern	2	4	3	Exc	2	4	4	Exc	1/3	Exc
G2. Anxiety	4	4	4	4	4	4	4	4	4	4
G3. Guilt feelings	4	4	4	4	4	4	4	4	4	4
G4. Tension	5	3	3	3	4	4	4	Exc	3/4	4
G5. Mannerisms and posturing	5	Exc	5	3	Exc	Exc	5	5	5	Exc
G6. Depression	4	4	4	4	4	4	4	4	4	4
G7. Motor retardation	1	1	1	Exc	1	1	1	1	1	1
G8. Uncooperativeness	3	3	3	3	4	3	3	Exc	1/3	3
G9. Unusual thought content	2	2	2	2	2	2	2	2	2/5	2
G10. Disorientation	Exc	5	5	Exc	5	Exc	5	Exc	5	5
G11. Poor attention	5	Exc	5	5	5	5	5	5	5	5
G12. Lack of judgment and insight	5	Exc	2	Exc	2	5	2	2	2/5	Exc
G13. Disturbance of volition	1	Exc	1	Exc	5	5	1	5	1/	Exc
G14. Poor impulse control	3	3	3	3	4	3	3	3	3	3
G15. Preoccupation	1	Exc	1	Exc	2/5	5	5	Exc	4/5	Exc
G16. Active social avoidance	4	1	3	1	1	Exc	1	1	1/2/3/4	1

Factors: 1 = negative, 2 = positive, 3 = excitement, 4 = anxiety/depression, 5 = disorganisation/cognitive.
A: Van der Gaag model with 30 items.
B: Van der Gaag model with 25 items.
Exc: item excluded from the study's factor model.

whether because they belong to different factors in different studies, or because they are excluded from the analyses. Seven specific items have been shown to be inconsistent: somatic preoccupation (GI), tension (G4) mannerisms and posturing (G%), lack of judgment and insight (G12), disturbance of volition (G13), preoccupation (G15) and active social avoidance (G16), although this last is generally associated with the negative scale. These differences cause a lack of unanimity for results obtained in projects that use the PANSS, since these results may depend on the particular model being used and the items that make up each factor in that model. Likewise, it may lead to different interpretations of specific symptoms. One example would be the item "lack of judgment and insight" (G12), which may be seen as a positive symptom of the disease in models that include it in the positive scale,[12,14,16,18] or as part of cognitive deterioration in models that include it in the disorganisation/cognitive factor.[7,15]

The lack of unanimity in the results is demonstrated by the relationships we find between the disorganisation/cognitive

factor, which is considered to be a deterioration measurement taken by the practitioner, and neuropsychological tests, considered to be an objective measurement of schizophrenic patients' cognitive performance. Some studies find a relationship between both types of measurements and therefore conclude that PANSS may be used as a reliable measurement of cognitive function.[7,21,22] However, another research series found no associations between the disorganisation/cognitive factor and objective neuropsychological evaluation, or else found basically insignificant correlations. These studies conclude that this factor may not be used to evaluate cognitive deterioration in schizophrenia.[17,18,23-25] Klingberg et al[18] believe that the lack of correlation cannot be explained by specific items that make up the disorganisation/cognitive factor. Nevertheless, in a prior study, Bryson et al[23] came to the opposite conclusion: they analysed three different factorial models and found that there was a correlation between that factor and the cognitive tests depending on the items making up that factor in each of the analysed models.

As shown in table 1, most of the models find that the disorganisation/cognitive factor is made up of the following: conceptual disorganisation, problems in abstract thinking, stereotyped thinking, disorientation and poor attention (P2, N5, N7, G10 and G11). Nevertheless, there are substantial differences with regard to the other series of items, such as lack of judgment and insight (G12), mannerisms and posturing (G5) or preoccupation (G15). In fact, in none of the nine models shown on the table, the disorganisation/cognitive factor is comprised of the same items. They vary from the model used by Lançon et al,[11] which includes two items, to models including seven items.[7,14,16]

The purpose of this study is to analyse the factorial structure of the PANSS in a sample of non-hospitalised patients and relate the factors obtained using objective cognitive measurements. Likewise, we propose evaluating the usefulness of PANSS as a measurement of cognitive performance in schizophrenia.

Material and methods

The study included 235 patients diagnosed with schizophrenia by psychologists in the public mental health system according to ICD-10 criteria. All patients are treated at the Psychosocial Rehabilitation Centre (CRPS) at Padre Menni Hospital in Santander, Spain. The CRPS treats a population with long-term mental illness, but for this study we only selected patients diagnosed with schizophrenia. The tests used in this study, which will be described further on, were administered to patients when they entered the rehabilitation programme. Here, they participate in training groups for cognitive skills, social abilities, psychoeducation, stress management, daily life skills and social/community integration. These groups were assigned according to each patient's individual rehabilitation needs. Tests were administered by clinical psychologists with CRPS's treatment team. Patients were taking antipsychotic drugs at all times during the study. The sample characteristics are displayed in table 2.

Table 2 Sample characteristics

Sex	
Men	148 (62.98)
Women	87 (37.02)
Age groups	
< 25	37 (15.74)
26-35	107 (45.54)
36-45	56 (23.83)
> 45	35 (14.89)
Educational level	
No completed studies	31 (13.19)
Primary level	101 (42.98)
Secondary level or higher	103 (43.83)
Time since onset	
< 5	57 (24.2)
5-10	72 (30.5)
> 10	106 (45.3)
Number of hospitalisations	
None	35 (14.8)
1	63 (26.9)
2	31 (13.4)
3	33 (13.9)
4	22 (9.3)
5	13 (5.6)
> 5	38 (16.2)
Time since onset	11.24 ± 7.31
Number of hospitalisations	2.57 ± 2.04
Age at onset	22.74 ± 6.58

Data expressed as n (%) or as a mean ± standard deviation.

Principal components analysis with a varimax rotation was used to evaluate the PANSS factor structure. We extracted eigenvalues greater than 1. Cognitive deterioration was evaluated using an abbreviated version of the Integrated Neuropsychological Exploration Programme (Barcelona Test).[26,27] Subtests employed were as follows: direct digits, inverse digits, category suggestion (words beginning with P), immediate and deferred text memorisation, word learning, immediate and deferred visual memory, comprehension, numbered keys and cubes. A previous study analysed the usefulness of this version for evaluating cognitive function in schizophrenia.[28] The correlation between the PANSS and Barcelona Test factors was calculated using Pearson's correlation coefficient.

Statistical analyses were performed using SPSS software version 12.0 for Windows.

Results

Analysis of principal components found the existence of six factors with eigenvalues greater than 1, which accounted for 58.61% of the variance (table 3). According to existing literature, the six resulting factors are called disorganisation (eigenvalue = 6.74, 22.47% of the variance), negative scale (eigenvalue =3.77, 12.56% of the variance),

Table 3 Configuration of six- and five-factor models

Items in PANSS	Factor 1		Factor 2		Factor 3		Factor 4		Factor 5		Factor 6	
	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]	1[a]	2[b]
P2. Conceptual disorganisation	0.64	0.63				0.55						
N7. Stereotyped thinking	0.69	0.66										
G4. Tension	0.52	0.57										
G5. Mannerisms and posturing	0.67	0.65										
G9. Unusual thought content	0.52	0.52			0.60	0.58						
G11. Poor attention	0.54	0.52										
G13. Disturbance of volition	0.72	0.68						0.53				
G15. Preoccupation	0.70	0.70										
N1. Blunted affect			0.81	0.82								
N2. Emotional withdrawal			0.70	0.70								
N3. Poor rapport			0.71	0.71								
N4. Social withdrawal			0.71	0.71								
N6. Lack of spontaneity and flow of conversation			0.77	0.78								
G7. Motor retardation			0.72	0.73								
P1. Delusions					0.78	0.79						
P3. Hallucinatory behaviour					0.54	0.62						
P5. Grandiosity					0.74	0.58						
P6. Suspiciousness					0.56	0.52						
G12. Lack of judgment and insight						0.53	0.52					
P4. Excitement							0.55	0.56				
P6. Suspiciousness							0.51	0.52				
P7. Hostility							0.80	0.80				
G8. Uncooperativeness							0.66	0.65				
G14. Poor impulse control							0.65	0.62				
G2. Anxiety		0.54							0.58	0.59		
G3. Guilt feelings									0.61	0.64		
G6. Depression									0.69	0.70		
N5. Difficulty in abstract thinking											0.63	Excc
G10. Disorientation											0.60	Excc

Factors: 1 = disorganisation, 2 = negative, 3 = positive, 4 = excitement, 5 = anxiety/depression, 6 = cognitive.
[a]6-factor model.
[b]5-factor model.
Exc: excluded from the model for having factor loading < 0.50.
G1 and G16 items were excluded from both models.

positive scale (eigenvalue = 2.36, 7.86% of the variance), activation (eigenvalue = 1.89, 6.3% of the variance), anxiety/depression (eigenvalue = 1.69, 5.62% of the variance) and cognitive (eigenvalue = 1.13, 3.78% of the variance). According to Mongay,[29] each factor includes only those items with factor loading > 0.5. G1 (somatic preoccupations) and G16 items (active social avoidance) were not significant for any of the six factors, and were consequently excluded from the model. On the contrary, G9 (unusual thought content) and G11 items (poor attention) represented more than one factor. In particular, item G9 was included in both the disorganisation and the positive factors, and G11 item in both the disorganisation and the cognitive factors. In this case, we decided to allow these two items to remain in both factors.

To evaluate the correlation of the six factors obtained using subtests from the Barcelona Test, we first calculated the score for each factor by adding up the points from the items belonging to that factor. Table 4 shows the score ranges for each factor, along with the mean and the standard deviation. This table also includes the PANSS subscales in their original categories (positive scale, negative scale, general psycopathy and total score). As we see in the table, the sample used in the study presented a low level of symptomatology in general. Correlations with the Barcelona Test are specified in Table 5. The cognitive factor was the only one to that was related to all of the subtests, as well as to the total score from the Barcelona Test. The negative factor was correlated with category evocation ($r = -0.246$, $p < 0.001$), immediate text

Table 4 Range of scores, means and standard deviations (SD) for each factor

	Range	Mean ± SD
Original category		
Positive scale	7-49	13.65 ± 5.90
Negative scale	7-49	17.82 ± 6.92
General psychopathology	16-112	29.01 ± 8.15
Total score	30-210	60.56 ± 16.97
6-factor model		
Disorganisation factor	8-56	13.92 ± 6.10
Negative factor	6-42	15.19 ± 6.65
Positive factor	6-42	13.43 ± 6.06
Excitement factor	5-35	9.07 ± 3.89
Anxiety/depression factor	3-21	6.79 ± 2.98
Cognitive factor	3-21	6.02 ± 2.57
5-factor model		
Disorganisation factor	9-63	16.33 ± 6.65
Negative factor	6-42	15.19 ± 6.65
Positive factor	7-49	15.33 ± 6.77
Excitement factor	5-35	9.07 ± 3.89
Anxiety/depression factor	3-21	6.79 ± 2.98

memory ($r = -0.190$, $p = 0.004$), delayed text memory ($r = -0.191$, $p = 0.004$), word learning ($r = -0.217$, $p = 0.002$), comprehension ($r = -0.136$, $p = 0.038$) and total score ($r = -0.203$, $p = 0.002$). The four remaining factors were only correlated with isolated subtests. The disorganisation factor was related to word learning ($r = -0.131$, $p = 0.045$) and comprehension ($r = -0.168$, $p = 0.010$). The positive factor was related to word learning ($r = -0.162$, $p = 0.013$), the anxiety/depression factor with numbered keys ($r = -0.143$, $p = 0.029$), and the activation factor was not related to any of the Barcelona Test subtests.

In the five-factor models listed in table 1, no distinction is made between the disorganisation and cognitive factors, and as has been said, research carried out to analyse the relationship between this factor and the objective cognitive measurements has not produced conclusive results. One essential difference between the factor analysis performed in this study and the five-factor models is that it obtained a specific factor that we call cognitive, and which was different from the disorganisation factor. Therefore, to evaluate the usefulness of a six-factor model compared with a five-factor model, we performed a new factor analysis with forced extraction of five factors which accounted for 54.83% of the variance. In this case, the items that were excluded, apart from G1 and G16, were N5 (difficulties in abstract thinking) and G10 (disorientation). These two items belonged to the cognitive factor in the first six-factor model. The five resulting factors coincided with those for the previous model, except for the cognitive factor. Likewise, in the five-factor model, the disorganisation factor and the positive factor are composed of one additional item each. The rest of the factors were made up of exactly the same items in both models. Table 3 shows a comparison between the two.

In the five-factor model, correlations with the Barcelona Test were only evaluated for the disorganisation and positive factors (table 5), since these were the ones presenting differences with respect to the initial six-factor model. The disorganisation factor was only related to comprehension ($r = -0.165$, $p = 0.011$) and not to word

Table 5 Pearson's correlation between PANSS factors and Barcelona Test subtests

Barcelona Test	Disorganisation factor		Negative factor	Positive factor		Excitement factor	Anxiety/depression factor	Cognitive factor
	A	B		A	B			
Direct digits	–0.022	–0.010	0.018	–0.026	–0.037	0.018	0.117	–0.217[a]
Inverse digits	0.025	0.051	–0.003	–0.033	–0.041	0.037	0.106	–0.239[a]
Categorical evocation	–0.043	–0.023	–0.246[a]	–0.008	–0.018	–0.005	0.107	–0.296[a]
Immediate text memory	–0.092	–0.089	–0.190[a]	–0.103	–0.169[a]	–0.105	–0.007	–0.377[a]
Delayed text memory	–0.019	–0.010	–0.191[a]	–0.042	–0.049	0.043	–0.014	–0.340[a]
Word learning	–0.131[b]	–0.110	–0.217[a]	–0.162[b]	–0.182[a]	–0.081	0.052	–0.415[a]
Immediate visual memory	0.054	0.054	–0.102	0.007	0.019	0.059	0.006	–0.166[a]
Delayed visual memory	0.017	0.037	–0.022	–0.059	–0.052	–0.031	0.083	–0.250[a]
Comprehension	–0.168[b]	–0.165[b]	–0.136[b]	–0.107	–0.116	–0.083	0.040	–0.481[a]
Numbered keys	–0.061	–0.047	–0.116	0.005	–0.014	0.112	–0.143[b]	–0.233[a]
Cubes	0.022	0.015	–0.037	0.000	–0.001	–0.031	–0.067	–0.226[a]
Total score	–0.080	–0.059	–0.203[b]	–0.119	–0.104	–0.083	0.065	–0.469[a]

A: 6-factor model.
B: 5-factor model.
[a]$p < 0.01$.
[b]$p < 0.05$.

learning; the positive factor was related to both immediate text memory ($r = -0.169$, $p = 0.009$) and word learning ($r = -0.182$, $p = 0.005$).

Discussion

In agreement with the previous investigation, the results of this study indicate that a three-factor model does not properly categorise the symptoms that the PANSS evaluates. The factors obtained in the forced five-factor model are those we have seen in previous studies: disorganisation, negative, positive, excitement and anxiety/depression, although in previous studies, the negative factor explains most of the variance; in our case, that would be the disorganisation factor. The main difference between this and previous studies arises with the six-factor model, since we present a sixth factor, the cognitive factor, as different from the disorganisation factor. As stated before, studies included in table 1 speak of a disorganisation or cognitive factor indistinctly, and these factors share a single set of items in almost all models. This fact seems to indicate that the investigations that have been carried out assume that the disorganisation and cognitive factors refer to the same group of symptoms.

In our study, however, items N5 and G10 are found under the cognitive factor exclusively in the six-factor mode, and only item G11 is found under both that factor and the disorganisation factor. When a forced five-factor analysis was performed, items N5 and G10 were excluded. Therefore, the results obtained in this study do not support the conclusion that the same symptoms make up the factor known as disorganisation/cognitive in previous studies; rather, we are faced with two different factors, made up of different symptoms. In particular, the disorganisation factor would be composed by the following: conceptual disorganisation (P2), stereotypical thinking (N7), tension (G4), mannerisms and posturing (G5), unusual thought content (G9), poor attention (G11), disturbances of volition (G13) and preoccupation (G15). Meanwhile, the cognitive factor would include difficulties in abstract thinking (N5), disorientation (G10) and poor attention (G11).

The correlations shown by the Barcelona Test also support the distinction between the two factors. In both the six-factor and five-factor models, the disorganisation factor showed correlations with only the verbal abstraction and comprehension subtests, while the cognitive factor was correlated with all subtests included in the study. Therefore, it seems more adequate to use the cognitive factor as a measurement of cognitive performance in schizophrenia and differentiate it from the disorganisation factor. In this sense, our results support the conclusion that the PANSS can be used to evaluate cognitive performance in schizophrenia. Nevertheless, given that the cognitive factor used in this study is composed of different items from those used in previous studies, our results actually coincide in part with correlations found in previous studies. As we see in Table 1, authors who found a correlation between the cognitive factor and neuropsychological measurements, such as Bell et al,[7] as well as those who found no significant correlations, such as Klingberg et al,[18] both include symptoms such as conceptual disorganisation, stereotypical thinking, tension, mannerisms and posturing or disturbances of volition (P2, N7, G4, G5, and G13) in the cognitive factor. In our study, these items belong to the disorganisation factor alone. As stated previously, that factor was shown to have fewer correlations with the Barcelona Test subtests than the cognitive factor. Therefore, some of the confusion in the listed studies could be due to analysing a set of symptoms which, according to our results, really belong to different dimensions and should therefore be analysed separately. In fact, Klingberg et al. offer individual evaluation of the correlations between items which he classifies as belonging to the disorganisation/cognitive model and cognitive tests. They find that item N5 (difficulties in abstract thinking) does correlate to attention and memory measurements, while this is not the case for G11 item (poor attention).

On the other hand, the scant correlation among the Barcelona Test subtests and the factors disorganisation, positive scale and excitement in our study support the idea that cognitive deficits are a characteristic trait in schizophrenics; they manifest independently from the presence of other series of psychotic symptoms,[30,31] and are present during stable phases.[32,33] The correlation found between the negative factor and the cognitive measurements coincides with evidence from previous studies, which also found an association between deterioration in cognitive areas, such as attention or executive function, and negative scale symptoms.[23,34] However, there is no unanimous agreement in the literature, since other series of studies do not confirm this relationship.[29,35]

One aspect receiving less study is the correlation between mood symptoms and cognitive performance in schizophrenia; this is partly because there is considered to be an overlap of negative and depressive symptomatology.[36] Some studies have found a relationship between depressive mood and attention and memory deficit.[37,38] However, other authors have not confirmed this correlation, or else have obtained only an association with motor function symptoms, such as motor slowing.[36,39] Our results seem to support the conclusion that anxious or depressive symptoms have a minimum affect on the cognitive performance of schizophrenic patients, since the anxiety/depression factor only correlated negatively with the numbered keys subtest, which is intended to measure processing speed.

In conclusion, our results suggest that it is more appropriate to use a six-factor model that differentiates between the disorganisation and cognitive factors. At present, there are no validated tests translated into Spanish that can be used to provide a brief evaluation of schizophrenic patients' cognitive performance. Therefore, the cognitive factor presented in this study could be used to this end in daily clinical practice. It could also serve as a screening tool for cognitive deficiencies (keeping in mind that future investigations will be needed to confirm the findings shown here). However, the cognitive evaluation will also have to be complemented with the administration of a more wide-reaching neuropsychological battery, since the cognitive factor in PANSS is made up of items that evaluate attention, verbal comprehension and orientation. It does not therefore include more specific cognitive

function measurements, such as operative memory, word learning or executive functions, which are all considered to be essential in schizophrenia.

The study's main limitation is its sample make-up. Since it contains long-term patients with a low symptomatology index, the results we obtained may not apply to other patient types, such as those experiencing a first psychotic episode, or those with more positive or disorganisation-type symptoms. Therefore, the conclusions we reach in this study should be interpreted with caution, and they will need to be compared with those from other patient samples. Likewise, additional research should be carried out in order to evaluate correlations between the cognitive factor identified in this study and psychosocial functioning measurements.

Conflict of interest

The authors affirm that they have no conflicts of interest.

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