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Psychometric properties of the Perceptual Aberration Scale and the Magical Ideation Scale in Spanish college students[1]

Eduardo Fonseca-Pedrero[2], Mercedes Paino, Serafín Lemos-Giráldez, Eduardo García-Cueto, Úrsula Villazón-García, and José Muñiz
(*Universidad de Oviedo and Centro de Investigación Biomédica en Red de Salud Mental CIBERSAM, Spain*)

ABSTRACT. The vulnerability for schizophrenia-spectrum disorders appears to be expressed across a dynamic continuum referred to as schizotypy. The Wisconsin-Madison psychosis-proneness scales are among the most extensively used self-reports for its measurement; however, the psychometric properties have not been widely investigated in Spanish populations. The aim of this instrumental work was to study the reliability and validity of the psychosis-proneness scales Perceptual Aberration Scale (PAS) and Magical Ideation Scale (MIS) in its adaptation into Spanish. The sample was composed of 737 college students with a mean age of 20.3 (*SD* = 3.3). The results indicated that both Wisconsin-Madison scales showed adequate psychometric properties. The construct validity analysis carried out on the matrix of polychoric correlations showed that both scales presented an essentially unidimensional solution. The Cronbach alpha coefficients were .96 (PAS) and .93 (MIS). The correlation between the total scores of both scales was .60. The Perceptual Aberration Scale and Magical Ideation Scale seem to be useful self-reports for the identification of subjects with a higher risk of developing schizophrenia-spectrum disorders. Future research should replicate these findings in samples of other nationalities, determine the contribution

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[2] Correspondence: Facultad de Psicología. Universidad a Oviedo. Plaza Feijoo, s/n. 33003 Oviedo (España). E-mail: efonseca@cop.es

of each dimension in the transition to psychosis, as well as apply them in clinical practice along with endophenotypes.

KEYWORDS. Schizotypy. Psychosis-proneness. Perceptual Aberration Scale. Magical Ideation Scale. Instrumental study.

RESUMEN. La vulnerabilidad a los trastornos del espectro esquizofrénico parece estar expresada a través de un continuo dinámico de adaptación denominado esquizotipia. Las escalas de Wisconsin-Madison se encuentran entre los autoinformes más ampliamente utilizados para su medición, sin embargo, las propiedades psicométricas no han sido extensamente investigadas en población española. El objetivo de este estudio instrumental fue estudiar la fiabilidad y la validez de las escalas de propensión a la psicosis *Perceptual Aberration Scale* (*PAS*) y *Magical Ideation Scale* (*MIS*) en su adaptación al español. La muestra estuvo compuesta por 737 estudiantes universitarios con una edad media de 20,3 (*DT* = 3,3). Los resultados indicaron que ambas escalas demostraron adecuadas propiedades psicométricas. El análisis de la validez de constructo llevado cabo sobre la matriz de correlaciones policóricas indicó una solución unidimensional tanto en la *PAS* como en la *MIS*. El coeficiente alfa de Cronbach fue igual a 0,96 (*PAS*) y 0,93 (*MIS*). La correlación entre las puntuación totales de ambas escalas fue de 0,60. Las escalas *Perceptual Aberration Scale* y *Magical Ideation Scale* parecen ser autoinfomes útiles para la identificación de sujetos con un mayor riesgo futuro a padecer trastornos del espectro esquizofrénico. Futuras investigaciones deberían replicar estos hallazgos en muestras de otras nacionalidades, determinar la contribución de cada una de las dimensiones en la transición hacía la psicosis, así como llevar a cabo su aplicación en combinación con endofenotipos en la práctica clínica.

PALABRAS CLAVE. Esquizotipia. Propensión a la psicosis. *Perceptual Aberration Scale*. *Magical Ideation Scale*. Estudio instrumental.

Efforts to identify subjects prone to developing schizophrenia-spectrum disorders using self-reports have significantly increased in the last few years (Fonseca-Pedrero, Paino *et al.*, 2008). The aim of studies on psychometric high risk is the early detection of subjects at elevated risk for schizophrenia and schizophrenia-spectrum disorders using their score profile on self-reports (Lenzenweger, 1994). At present, it is considered to be a feasible and useful strategy which permits a series of advantages with respect to other assessment methods (*e.g.*, interviews or neuroimaging techniques), as it is a noninvasive method of rapid application and easier administration, scoring and interpretation (Gooding, Tallent, and Matts, 2005). In addition, it allows the study of participants prior to the appearance of possible side effects of medication or hospitalization that complicate the study of patients with disorders.

Historically, Meehl (1962) coined the term schizotypy to refer to a personality organization which represents vulnerability to psychosis. It is assumed that, although

most schizotypal subjects will never develop the clinical form of psychosis, they usually present a series of cognitive, behavioural, social, emotional, psychophysiological and/or neurobiochemical alterations indicative of their risk status (Fonseca-Pedrero, Muñiz, Lemos-Giráldez, García-Cueto, and Campillo-Álvarez, 2007; Raine, 2006; Siever and Davis, 2004). These empirical findings seem to support the hypothesis that the neurodevelopmental vulnerability to schizophrenia is expressed across a dynamic continuum of adjustment named schizotypy (Kwapil, Barrantes-Vidal, and Silvia, 2008), which can fluctuate between two extreme poles, health and illness (psychosis) (Claridge, 1997), based on the interaction of biopsychological factors (Lemos Giráldez, 2003).

In the literature, there are a wide variety of questionnaires for the assessment of schizotypy or psychosis proneness (Fonseca-Pedrero, Paino *et al.*, 2008). Among the most widely used scales we find the Wisconsin-Madison scales (Chapman, Chapman, and Kwapil, 1995) and the Schizotypal Personality Questionnaire (SPQ) by Raine (1991). Included in the Chapman scales, which are based on Meehl's theory, we find the Perceptual Aberration Scale (PAS) (Chapman, Chapman, and Rawlin, 1978), Magical Ideation Scale (MIS) (Eckblad and Chapman, 1983), Revised Social Anhedonia Scale (RSAS) (Eckblad, Chapman, Chapman, and Mishlove, 1982) and Physical and Social Anhedonia Scales (PhA-SoA) (Chapman, Chapman, and Raulin, 1976).

The relevance of the PAS, MIS, RSAS and PhA scales resides basically in four points: a) they have been used in a large diversity of research studies (see Table 1); b) they are the basis of other more comprehensive schizotypy assessment self-reports such as the *Oxford-Liverpool Feelings and Experiences* (O-LIFE) (Mason and Claridge, 2006) or the *Thinking and Perceptual Style Questionnaire* (TPSQ) (Linscott and Knight, 2004); c) they are the only self-reports which have proved their predictive validity in independent longitudinal studies, showing that participants with high scores, followed prospectively, present a greater probability of developing schizophrenia-spectrum disorders compared to subjects in a control group (Gooding *et al.*, 2005; Gooding, Tallent, and Matts, 2007; Kwapil, 1998); this is also the best predictor, among a wide range of psychopathological variables, with respect to the later development of these types of disorders (Gooding *et al.*, 2005); and d) lastly, their psychometric properties have been extensively investigated; thus, the most recent studies indicate that the internal consistency indices for the scales range from .77 to .90 and the test-retest values range from .41 to .84. The construct, convergent, discriminant and predictive validities have also been investigated (Chapman *et al.*, 1995; Edell, 1995; Fonseca-Pedrero, Paino *et al.*, 2008; Kwapil, Crump, and Pickup, 2002).

TABLE 1. Main studies on the Perceptual Aberration Scale and Magical Ideation Scale.

Reference	*Scales**	*Sample***	*Topic/Aim*
Horan, Reise, Subotnik, Ventura, and Nuechterlein (2008)	PAS;MIS:PhA	72 patients 54 CC	Validity in patients with schizophrenia
Kwapil *et al.* (2008)	MIS; PAS; RSAS; PhA	6137 university students	Dimensional structure of Chapman scales
Lenzenweger, Miller, Maher, and Manschreck (2007)	PAS; MIS; SPQ	25 high schizotypy; 29 CC university students	Frequency and normal associations in verbal utterances
Rawlings, Williams, Haslam, and Claridge (2008)	PAS; MIS; SoA; PhA	1073 normal adults	Taxonometric analysis
Lewandowski *et al.* (2006)	PAS; MIS; RSAS; PhA	1258 university students	Anxiety and depression symptoms
Wuthrich and Bates (2006)	PAS; MIS; RSAS; SPQ	1059 university students	Confirmatory factor analysis
Kerns (2006)	PAS; MIS; RSAS; SPQ	261 university students	Emotional processing and cognitive control
Diwadkar, Montrose, Dworakowski, Sweeney, and Keshavan (2006)	PAS; MIS	33 FF; 34 CC	Genetic high-risk adolescents with schizotypy
Gooding, Matts, and Rollmann (2006)	PAS; MIS; RSAS; PhA	256 high schizotypy; 137 CC	Sustained attention deficit Endophenotypes
Gooding *et al.* (2005)	PAS; MIS; RSAS; PhA	91 high schizotypy; 44 CC	Predictive validity
Collins, Blanchard, and Biondo (2005)	PAS; MIS; RSAS	85 with social anhedonia; 85 CC	Behavioral signs of schizoidia
Camisa *et al*. (2005)	PAS; MIS; RSAS	140 patients and normals	Personality traits in schizophrenia-spectrum disorders

Notas. *SPQ: Schizotypal Personality Questionnaire; PAS: Perceptual Aberration Scale; MIS: Magical Ideation Scale; SoA: Social Anhedonia Scale; RSAS: Revised Social Anhedonia Scale; PhA: Physical Anhedonia Scale.**Used samples: CC: Controls; FF: Schizophrenic patients' family members.

Some of the most representative studies of the Chapman psychosis-proneness scales in the last few years are shown in Table 1. The PAS and the MIS scales present a high intercorrelation (around .60), which has made some researchers develop a global score for both as an index of schizotypy (Kwapil, Miller, Zinser, Chapman, and Chapman, 1997).Versions in a computerized Likert-type format have also been utilized (Wuthrich and Bates, 2006). In addition, these scales have been adapted to different cultures; in Spain they have been used in their adaptation to Catalan (Barrantes-Vidal *et al*., 2002; Muntaner, García-Sevilla, Fernández, and Torrubia, 1988), however, their psychometric properties have not yet been studied in depth in nonclinical Spanish populations.

The present instrumental study (Montero and León, 2007) attempted to study the validity and reliability of the Perceptual Aberration Scale and the Magical Ideation Scale in their versions which were adapted to Spanish following international standards regarding the translation and adaptation of tests (Muñiz and Bartram, 2007). The determination of the number and structure of the dimensions underlying these scales was also attempted in order to improve the understanding and the delimitation of schizotypy. This way, we can avail of self-reports with adequate psychometric guarantees for the detection and intervention of subjects with greater theoretical proneness to developing schizophrenia-spectrum disorders, which permits the comparison of the schizotypy structure throughout different cultures.

Method

Participants

The final sample was composed of 737 university students, 567 (76.1%) were women enrolled in a total of 9 different careers at the University of Oviedo: Law, Psychology, Education, Philology, Philosophy, Tourism, Pedagogy, Mathematics and, Speech Therapy. The mean age of the participants was 20.30 (*SD* = 3.30). The average years of education was 16.60 (*SD* = 2.70). Participants did not receive any type of incentive for their participation in the study.

Instruments

- Perceptual Aberration Scale (PAS) (Chapman *et al.*, 1978). The PAS has been used for the assessment of perceptual distortions associated to body image (*e.g.*, "I sometimes have had the feeling that my body is abnormal"). It is composed of 35 items in a dichotomous *True*/*False* format. Its internal consistency ranges from .84 to .90 and the test-retest reliability from .43 to .84. The validity of the PAS is sustained by a wide diversity of data (Chapman *et al.*, 1995; Edell, 1995; Fonseca-Pedrero, Paino *et al.*, 2008; Kwapil *et al.*, 2008).
- Magical Ideation Scale (MIS) (Eckblad and Chapman, 1983). It is a scale used for the assessment of superstitious and magical beliefs and thoughts as well as of the capacity of thought reading or broadcasting (*e.g.*, "I have sometimes felt strangers were reading my mind"). It is composed of 30 items in a dichotomous *True*/*False* format. Its internal consistency ranges from .78 to .92 and its test-retest reliability from .41 and .84. Its correlation to the PAS is around .53 and .75. The validity of the MIS as a measure of schizotypy is sustained by a wide diversity of data (Chapman *et al.*, 1995; Edell, 1995; Fonseca-Pedrero, Paino *et al.*, 2008; Kwapil *et al.*, 2008) (see Table 1).
- Infrequency Scale (INFS) (Chapman and Chapman, 1983). It consists of 13 items in a dichotomous *True*/*False* format (*e.g.*, "Driving from New York to San Francisco is generally faster than flying between these cities"). The objective is to detect those participants who respond randomly, pseudorandomly or dishonestly to the questionnaire. This way, those subjects with 3 or more randomly answered items were eliminated from the final sample. Based on their score on the scale, a total of 53 participants were excluded. The INFS has also been used in other studies on schizotypy (Kerns, 2006; Kwapil *et al.*, 2008).

Procedure

The translation and adaptation of both scales was carried out using the "back translation procedure" following international guidelines (Balluerka, Gorostiaga, Alonso-Arbiol, and Haranburu, 2007; Muñiz and Bartram, 2007). The English original version was translated into Spanish by an expert in the subject matter. This version was then translated into English by another researcher familiar with English culture. Finally a third researcher compared both English versions (original and translated).

The administration of the questionnaire was carried out collectively in groups of 30 to 50 participants. They were at all times reminded of the confidentiality of their

answers and of the voluntary character of their participation. The application took place under supervision of the researchers, with a view to minimizing errors.

Data analysis

After checking the normality and sphericity assumptions, the mean scores, standard deviations, asymmetry, and kurtosis indices were calculated for each item as well as the total score of both scales. Confirmatory factorial analyses (CFA) were carried out to test the unidimensional model. The method of estimation was Diagonally Weighted Least Squares. Since the item scores were non-normally distributed ordinal variables, the CFA was conducted on the polychoric correlation matrix (Jöreskorg and Sörbom, 1993). Item parceling was performed for the study of the convergent validity between both scales. Three parcels were created for each of the scales from which the items were randomly selected according to suggestions by Little, Cunningham, Shalar, and Widaman (2002). It is recommended to conduct item parcels either when the number of items is too large or when a normal distribution is not observed. The covariation of measurement errors was never allowed. In this case, Maximum-Likelihood (ML) estimation was the method employed. Six fit statistics were considered: the chi-square, ratio chi-square-df (χ^2/df), the adjusted goodness-of-fit index (AGFI), the root mean square of approximation (RMSEA), the comparative fit index (CFI) and non-normed fit index (NNFI). A non-statistically significant chi-square value ($p > .05$) indicates a good model fit. Unfortunately, chi-square is very sensitive to sample size. It is recommended that ratio χ^2/df be less than two. AGFI is a fit measure reducing g dependence on sample size. Varying form 0 to 1, an AGFI value > .90 indicates a good model fit. An RMSEA value < .05 indicates a reasonable error of approximation of population. Finally, the CFI and NNFI indices vary from 0 to 1. Values between .92 and .95 are considered well-fitting (Kline, 2005). Cronbach's alpha coefficient was calculated for ordinal data (Elosúa y Zumbo, 2008). SPSS 13.0, FACTOR (Lorenzo-Seva and Ferrando, 2006) and LISREL 8.7 were used for all data analysis.

Results

Descriptive statistics of the scales

The PAS mean score for the total sample was 6.65 (*SD* = 5.51) whereas that of the MIS was 7.07 (*SD* = 4.73). The mean score on the PAS was 6.55 (*SD* = 5.59) for males and 6.68 (*SD* = 5.64) for females. The mean score on the MIS was 7.07 (*SD* = 4.88) for males and 7.07 (*SD* = 4.70) for females. No significant differences were found in the total score on the PAS ($t = -.261$; $p = .79$) or the MIS ($t = .006$; $p = .99$) due to gender. The descriptive statistics, mean and standard deviations, for the items on both scales are presented in Tables 2 and 3.

Confirmatory factor analysis

For the Perceptual Aberration Scale (PAS) the fit indices corresponding to the unidimensional model were: $\chi^2 = 1088.71$, $df = 560$, $p < .001$; $\chi^2/df = 1.95$; $RMSEA = .035$

[90% C.I: .033-.039]; *AGFI* = .96; *CFI* = .99 and *NNFI* = .99. The standardized coefficients were statistically significant, ranging from .29 to .88. Table 2 shows the estimated coefficients. In addition, large positive and negative standardized residuals were found. Most of the fit indices were adequate, except for χ^2, showing a reasonable goodness-of-fit and parsimony of the unidimensional model.

TABLE 2. Descriptive statistics, discrimination index and standardized factorial loadings for the Perceptual Aberration Scale.

Items	*Mean (SD) Total sample (n = 737)*	*Mean (SD) Men (n = 176)*	*Mean (SD) Women (n = 561)*	*Discrimination index*	λ_x
1	.24 (.43)	.27 (.44)	.23 (.42)	.58	.82
2	.21 (.41)	.20 (.40)	.21 (.41)	.57	.80
3	.58 (.49)	.41 (.49)	.63 (.48)	.32	.48
4	.38 (.49)	.41 (.49)	.37 (.48)	.33	.46
5	.42 (.49)	.44 (.50)	.41 (.49)	.38	.53
6	.28 (.45)	.28 (.45)	.28 (.45)	.22	.33
7	.08 (.28)	.09 (.28)	.08 (.27)	.47	.81
8	.02 (.15)	.02 (.15)	.02 (.14)	.27	.64
9	.17 (.38)	.16 (.37)	.17 (.38)	.25	.39
10	.23 (.42)	.23 (.42)	.23 (.42)	.40	.59
11	.18 (.38)	.23 (42)	16 (.37)	.31	.47
12	.41 (.49)	.32 (.47)	.43 (.50)	.44	.64
13	.43 (.50)	.52 (50)	.41 (.49)	.20	.29
14	.14 (.35)	.15 (36)	.14 (.35)	.61	.88
15	.13 (.34)	.11 (.31)	.14 (.34)	.54	.76
16	.12 (.32)	.09 (.29)	.13 (.33)	.59	.87
17	.21 (.41)	.19 (.39)	.21 (.41)	.40	.57
18	.11 (.31)	.11 (.32)	.11 (.31)	.40	.67
19	.05 (.22)	.03 (.18)	.06 (.23)	.35	.65
20	.20 (.40)	.16 (.37)	.22 (.41)	.24	.36
21	.07 (.26)	.08 (.27)	.07 (.25)	.38	.21
22	.08 (.28)	.08 (.27)	.08 (.28)	.51	.81
23	.08 (.27)	.08 (.27)	.07 (.26)	.42	.71
24	.36 (.48)	.40 (.49)	.35 (.48)	.31	.44
25	.17 (.38)	.18 (.38)	.17 (.38)	.36	.54
26	.12 (.33)	.11 (.31)	.13 (.33)	.33	.57
27	.12 (.32)	.19 (.39)	.10 (.30)	.43	.64
28	.04 (.19)	.06 (.24)	.03 (.17)	.34	.68
29	.08 (.27)	.05 (.21)	.09 (.28)	.37	.64
30	.05 (.23)	.05 (.21)	.06 (.23)	.35	.63
31	.13 (.34)	.14 (.35)	.13 (.33)	.41	.61
32	.13 (.33)	.15 (.36)	.12 (.33)	.42	.64
33	.07 (.25)	.04 (.20)	.08 (.27)	.47	.76
34	.07 (.25)	.06 (.23)	.07 (.25)	.42	.77
35	.50 (.50)	.47 (.50)	.51 (.50)	.37	.53

Note. λ_x: standardized coefficients. All standardized coefficients were statistically significant ($p < .05$).

For the Magical Ideation Scale (MIS) the fit indices corresponding to the unidimensional model were: $\chi^2 = 921.34$, $df = 405$, $p < .001$; $\chi^2/df = 2.28$; *RMSEA* = .042 [90% C.I: .038-.045]; *AGFI* = .95; *CFI* = .98 and *NNFI* = .98. The standardized coefficients were statistically significant (with the exception of item 30), ranging from .72 to .29 (see Table 3). Large positive and negative standardized residuals were also found. As can be observed, the value of the χ^2 leads us to reject the model although this indicator is very sensitive to sample size. The remaining indices adopted values which were adequate, showing a reasonable fit to the unidimensional model.

TABLE 3. Descriptive statistics, discrimination index and standardized factorial loadings for the Magical Ideation Scale.

Items	*Mean (SD) Total sample (n = 737)*	*Mean (SD) Men (n = 176)*	*Mean (SD) Women (n = 561)*	*Discrimination index*	λ_x
1	.24 (.43)	.19 (0.40)	.26 (.44)	.43	.66
2	.26 (.44)	.20 (0.40)	.27 (.45)	.43	.65
3	.40 (.49)	.32 (0.47)	.43 (.49)	.37	.53
4	.25 (.43)	.24 (0.43)	.25 (.44)	.21	.30
5	.13 (.34)	.18 (0.38)	.12 (.33)	.26	.44
6	.08 (.27)	.09 (0.28)	.08 (.27)	.34	.61
7	.45 (.50)	.51 (0.50)	.43 (.50)	.21	.29
8	.57 (.50)	.51 (0.50)	.59 (.49)	.33	.49
9	.15 (.36)	.16 (0.37)	.15 (.36)	.31	.49
10	.43 (.50)	.44 (0.50)	.43 (.50)	.40	.60
11	.22 (.42)	.23 (0.42)	.22 (.41)	.38	.60
12	.25 (.43)	.19 (0.39)	.27 (.44)	.47	.70
13	.17 (.37)	.18 (0.38)	.16 (.37)	.41	.64
14	.22 (.42)	.22 (0.42)	.22 (.42)	.39	.58
15	.32 (.47)	.30 (0.46)	.33 (.47)	.28	.39
16	.17 (.38)	.19 (0.40)	.16 (.37)	.47	.72
17	.25 (.43)	.18 (0.39)	.27 (.44)	.31	.47
18	.22 (.41)	.37 (0.48)	.17 (.38)	.31	.48
19	.47 (.50)	.45 (0.50)	.48 (.50)	.28	.39
20	.13 (.34)	.26 (0.44)	.09 (.29)	.28	.48
21	.13 (.34)	.13 (0.34)	.13 (.34)	.37	.61
22	.31 (.46)	.20 (0.40)	.35 (.48)	.25	.36
23	.15 (.35)	.13 (0.33)	.15 (.36)	.21	.38
24	.15 (.36)	.15 (0.36)	.16 (.36)	.30	.46
25	.04 (.20)	.08 (0.27)	.03 (.18)	.27	.60
26	.06 (.23)	.09 (0.29)	.04 (.21)	.29	.60
27	.11 (.31)	.11 (0.31)	.11 (.32)	.36	.58
28	.16 (.37)	.16 (0.37)	.16 (.37)	.41	.64
29	.09 (.28)	.10 (0.30)	.08 (.27)	.31	.57
30	.48 (.50)	.51 (0.50)	.47 (.50)	.13	.16*

Note. λ_x: standardized coefficients; * Statistically non-significant: $p > .05$.

Convergent validity

The correlation between the PAS and the MIS total scores was .60. Finally, a confirmatory factorial analysis of the item parcels of both scales was performed using ML estimation. Two models were tested: a unidimensional model, supposing that only one general dimension (positive schizotypy) underlies both scales and a bidimensional model (for Perceptual Aberration and Magical Ideation). The fit indices corresponding to the unidimensional model were: $\chi^2 = 386.8$, $df = 9$, $p < .001$; $\chi^2/df = 42.9$; *RMSEA* = .213 [90% C.I: .193-.231]; *AGFI* = .65; *CFI* = .91 and *NNFI* = .84; but the fit indices corresponding to the bidimensional model were: $\chi^2 = 30.8$, $df = 8$, $p = .001$; $\chi^2/df = 3.85$; *RMSEA* = .057 [90% C.I: .034-.081]; *AGFI* = .96; *CFI* = .99 and *NNFI* = .99. Likewise, standard coefficients in this model ranged from .75 to .86, and square multiple correlation coefficients were higher than .56. The results indicated that a bidimensional solution was the most adequate.

Study of internal consistency

The internal consistency reliabilities estimated for the PAS and the MIS were excellent. The internal consistency of the PAS was .96. As is shown in Table 2, the indices of discrimination of the items ranged from .20 to .59. The internal consistency of the MIS was .93. The indices of discrimination of the MIS were greater than .20 except for item 30 (see Table 3).

Discussion

The Wisconsin-Madison psychosis-proneness scales Perceptual Aberration Scale (PAS) and Magical Ideation Scale (MIS) are two of the most used self-reports in the assessment of schizotypy or vulnerability towards schizophrenia-spectrum disorders, nonetheless there are few studies that analyze the structure of the underlying dimensions in Spanish populations. The purpose of the present work was to study the reliability and validity of the Spanish version of the PAS and MIS in nonclinical young adults.

The descriptive statistics, construct and convergent validities as well as the internal consistency obtained are similar to those found in previous studies (Fonseca-Pedrero, Paino *et al.*, 2008; Kwapil *et al.*, 2008; Kwapil *et al.*, 2002). With respect to the mean and standard deviation, the obtained values are similar to those of previous literature; however, the mean score on the PAS is slightly higher. In accordance with previous literature (Kwapil *et al.*, 2002; Miettunen and Jääskeläinen, in press; Wuthrich and Bates, 2006) no statistically significant gender differences were found in the total score on either scale, although some studies have found that women scored higher on positive symptoms of schizotypy when using these scales for its measurement (Kwapil *et al.*, 2008; Muntaner *et al.*, 1988). The construct validity analysis using the polychoric correlation matrix showed that the data fit reasonably well with a unidimensional solution for both the PAS and the MIS, with adequate standardized coefficients and explaining a high percentage of the total variance. The levels of internal consistency of both scales were adequate, although higher than those found in the previous literature. The correlation between the total scores (.60) revealed adequate convergent validity for the PAS and

MIS. Contrary to the unidimensional model underlying the Wisconsin-Madison schizotypy scales in which the PAS and the MIS make up the positive dimensión of schizotypy (Kwapil *et al.*, 2008), the confirmatory factorial analysis conducted in this study showed that the two-dimensional solution (Perceptual Aberrations and Magical Ideation) was that which presented the best fit indices compared to the model that postulated the existence of only one dimension of positive schizotypy. These results present a certain resemblance to some of the DSM-IV diagnostic criteria for schizotypal personality disorder (American Psychiatric Association, 1994). Recently, Kwapil *et al*. (2008) in a study with 6,137 university students, applied the PAS, MIS, PhA and RSAS scales and found internal consistency coefficients for the MIS and PAS ranging from .84 to .90, and from .84 to .89 respectively, with a correlation of .69 between them.

Schizotypy is a heterogeneous construct in continuous evolution and reconstruction which permits the understanding of the underlying mechanisms in schizophrenia as well as the links between both entities without the secondary effects of medication, stigmatization or hospitalization. It seems that schizotypy is a personality construct which is distributed along a dynamic neurodevelopmental vulnerability continuum toward schizophrenia (Lewandowski *et al*., 2006). Raine (2006), in an excellent revision, hypothesized that subjects with high psychometric schizotypy or schizotypal subjects could be provisionally defined as pseudoschizotypal whereas participants with a family history of schizophrenia or neurodevelopmental markers could be defined as neuroschizotypal. This way, in the pseudoschizotypal, environmental-psychosocial influences, postnatal adverse events as well as cognitive-perceptual traits may be playing a more predominant role, and it is probable that they would respond better to psychological treatments.

As was already mentioned, the utilization of self-reports such as the PAS and MIS scales for the detection of individuals at risk for psychosis permits a series of advantages with respect to other assessment methods. Likewise, this approach is considered a relevant and promising research field for the detection of subjects prone to schizophrenia-spectrum disorders (Gooding *et al.*, 2005, 2007) with a view to the subsequent application of prophylactic treatments. Obviously, the detection of participants at risk for the development of schizophrenia-spectrum disorders through self-reports only makes sense if it is performed using valid, reliable and adequate adaptations following international standards (Carretero-Dios and Pérez, 2007). The data indicate that the PAS and the MIS showed good psychometric properties: both have adequate psychometric guarantees for their use in nonclinical research as well as their use as a good screening method for the study of the proclivity to psychosis in normal populations.

Nevertheless, the results found in this study should be interpreted in the light of some possible limitations. Firstly, the sample was exclusively composed of college students. Secondly, schizotypy is a psychological construct with a multidimensional nature composed of three or four dimensions (Fonseca-Pedrero *et al.,* 2007; Paino, Fonseca-Pedrero, Lemos-Giráldez, and Muñiz, 2008) similar to that found in schizophrenic patients (Lenzenweger and Dworkin, 1996). In the present study, the PAS and MIS scales, which assess only the positive dimension of schizotypy, were used. Thirdly, no other self-reports were used for the assessment of depressive symptomatology and

social anxiety which are frequently related to schizotypy. Finally, another limitation of the present study is that neither the participants' familiarity with psychiatric disorders and/or current treatment were assessed in our sample.

Future research should replicate these findings in other cultures as well as conduct longitudinal studies with the aim of determining the sensitivity, specificity and test-retest reliability of the scales, as well as the nature of schizotypy (dimensional/taxometrics) in other populations (Caparros, Barrantes-Vidal, Viñas, and Obiols, 2008; Fonseca-Pedrero, Lemos-Giráldez, Muñiz, García-Cueto, and Campillo-Álvarez, 2008; Fonseca-Pedrero, Lemos-Giráldez, Paino, Villazón-García, Sierra-Baigrie, and Muñiz, 2009). It must also be pointed out that sufficient empirical evidence has been accumulated to support the psychosis-proneness scales as shown by clinical, psychometric and genetic high risk studies or their different combinations (Alvarez-Moya, Barrantes-Vidal, Navarro, Subira, and Obiols, 2007; Diwadkar *et al*., 2006; Mason *et al*., 2004; Morrison *et al.*, 2006). These studies highlight the predominant role played by schizotypy and hence, we are in a position to take a leap forward to daily practice (clinical and educational) with the aim of early detection and intervention with these types of high-risk individuals.

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