COGNITIVE INSIGHT AND SCHIZOTYPY IN NON-CLINICAL ADOLESCENTS

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Abstract

Cognitive insight is a metacognitive construct that has been shown to be useful in detecting vulnerability to schizophrenia spectrum disorders and, in particular to schizotypy. The main purpose of the study was to analyze the relationship between the cognitive insight and schizotypy in a sample of non-clinical adolescents, and to analyze the sensitivity and specificity of the cognitive insight in differentiating vulnerability to schizotypy. Participants were non-clinical adolescents selected by cluster sampling (school), with random group-class selection. The Cognitive Insight Scale and the Esquizo-Q-A were used. Results: We found a different cognitive insight profile from that found in previous studies, with a lower score in self-reflection and a higher score in self-certainty. Self-reflection and the composite index would allow us to classify participants with risk scores in distortion of reality and interpersonal disorganization. The cognitive insight would be a useful construct for detecting vulnerability to schizotypy in non-clinical adolescents, and would allow the design of effective interventions.
KEY WORDS: *Cognitive insight, schizotypy, adolescents, ROC curves.*

Resumen

El insight cognitivo es un constructo metacognitivo que ha mostrado utilidad para detectar la vulnerabilidad a trastornos del espectro esquizofrénico, y junto con la esquizotipia, permiten investigar, comprender y ayudar en el tratamiento de estos trastornos. El propósito principal del estudio fue analizar la relación entre insight cognitivo y esquizotipia en una muestra de adolescentes no clínicos, y analizar la sensibilidad y especificidad del insight cognitivo para diferenciar la vulnerabilidad en esquizotipia. Los participantes fueron adolescentes no clínicos seleccionados mediante un muestreo por conglomerados (centro educativo), con selección aleatoria de grupo-clase. Se utilizaron la "Escala Beck de insight cognitivo" y el "Esquizo-Q-A". Encontramos un perfil de insight cognitivo diferente al encontrado en estudios previos, con una puntuación inferior en autorreflexión y una superior en autocerteza. La autorreflexión y el índice compuesto permitirían clasificar a participantes con puntuaciones de riesgo en distorsión de la realidad y

desorganización interpersonal. El insight cognitivo podría ser un constructo útil para detectar la vulnerabilidad a la esquizotipia en adolescentes no clínicos, y permite el diseño de intervenciones eficaces.

PALABRAS CLAVE: *insight cognitivo, esquizotipia, adolescentes, curvas ROC.*

Introduction

Cognitive insight is defined as the capacity to distance oneself from one's own mistakes and the ability to make a correct evaluation of one's own interpretations using external feedback from others (Beck et al, 2004). It consists of two dimensions, self-reflection (SR), i.e., the capacity to recognise and to evaluate the mistakes made in interpreting one's own experiences, and to take into account alternative hypotheses so as to reach a reasoned conclusion; and self-certainty (SC), related to the accuracy of one's beliefs and an excessive self-confidence in the said beliefs. An evaluation scale to measure cognitive insight was developed and has been widely used, in both clinical and research contexts (Van Camp et al., 2017). Cognitive insight is considered to be a complex metacognitive capacity, particularly as concerns flexibility and confidence in one's own beliefs, judgement and experiences (Birulés et al., 2020; Riggs et al., 2012; Simón-Expósito & Felipe-Castaño, 2019; Vohs et al., 2015), an aspect which is damaged in persons suffering from schizophrenia and psychotic disorders (Elowe & Conus, 2017).

The first study of the relationship between cognitive insight and schizophrenia was carried out by Beck & Warman in 2004. Numerous later works carried out more detailed studies into this aspect; also widening the scope of the study to include other psychopathological disorders, although we still do not have conclusions that are agreed upon by all the researchers.

The reviewed studies, which use clinical samples of patients with schizophrenia, have found that SR correlates inversely with the positive symptoms, while SC correlates directly (Beck & Warman, 2004; Penney et al., 2020; Vohs et al., 2015; Warman et al., 2007). Other works of research only show correlations with one of the dimensions of insight. Thus, SR would correlate positively (Engh et al., 2009) or negatively (Bora et al., 2007) with the negative symptoms. Other studies have found a positive relation between SC and the positive symptoms (Bruno et al., 2012; Lysaker et al., 2010), although this result has not always been confirmed (Penney et al., 2018), as well as a positive correlation with the negative symptoms (Pedrelli et al., 2004; Vohs et al., 2015).

According to Beck et al. (2004), it is possible to differentiate between healthy individuals and persons with psychotic disorders through the scores obtained in cognitive insight. In this sense, the studies that compare clinical samples with healthy controls find higher scores in SC in the clinical participants (Simón-Expósito & Felipe-Castaño, 2022). Other research works have found higher scores in SR in patients when compared to healthy controls (Penney et al., 2018). The studies of populations with a high clinical risk of psychosis also found higher scores in SC when compared to healthy controls (Dondé et al., 2020; Uchida et al., 2014). Similarly, in non-clinical participants with high scores in schizophrenia, a correlation was found between SC

and the positive dimension of schizotypy (Sacks et al., 2012). In non-clinical participants with high scores in delusional tendencies, higher scores were also found in both SC and SR (Carse & Langdon, 2013; Warman & Martin, 2006).

The dimensional view of psychopathology has led to a great number of studies which have analysed the presence of schizotypy traits in the general population, experiencing similar symptoms to those of psychotic patients, but without showing any clinical disorder (van Os et al., 2009). Schizotypy has been related to the aetiology of schizophrenia (Lenzenweger, 2018) and is manifested as schizotypy traits, experiences of a psychotic nature or subclinical psychotic symptoms. As a risk construct, schizotypy can provide a useful structure through which to focus the aetiology, course, treatment and prevention of psychotic experiences (Fonseca-Pedrero, 2021).

Studying cognitive insight and the schizotypy personality are both within the bounds of the same multidimensional construct of the psychotic spectrum as well as the normal personality. Up to the present time, many of the reviewed studies on cognitive insight have been carried out using clinical populations and comparing them with healthy controls, in youth or adult populations. We have found few studies on cognitive insight with non-clinical participants and in the adolescent population; despite the fact that the epidemiological data seem to show that psychotic experiences are a common phenomenon in adolescents in the general population, where there is a higher rate than in clinical samples, at around 5-8% in the general adolescent population (Linscott & van Os, 2013; McGrath et al., 2015), and higher than those found in the adult population (Kelleher et al., 2012).

Nevertheless, it is still not clear how cognitive insight in persons with psychotic disorders compares with that of healthy persons (Martin et al., 2010); so, it would seem to be necessary to investigate further, widening the age range and the characteristics of the participants in studies. Therefore, the main objectives of this study were to: 1) Describe and analyse the relation between cognitive insight and the dimensions of schizotypy in a sample of non-clinical adolescents y 2) analyse the sensitivity and specificity of the scores concerning self-reflection (SR) and self-certainty (SC) for classifying subjects with a high vulnerability/predisposition to schizotypy. The consequent hipotheses were, firstly we find a negative relation between SR and schizotypy and a positive one between SC and schizotypy and, secondly, the scores in SR and SC will allow us to distinguish participants with scores that indicate a high risk of or vulnerability to schizotypy.

Method

Participants

The initial sample consisted of 376 adolescents, studying at different educational levels, to be precise, obligatory secondary education, or various options of further education. They were selected by means of cluster sampling, using the educational centre as the cluster; we selected 10 educational centres at random from those in the autonomous region, and two classrooms from each centre. From this initial selection, 23 cases (6%) were eliminated as they did not complete all the

questionnaires or they obtained a higher score than that required in the Oviedo Scale of Response Infrequency (Fonseca-Pedrero et al., 2009).

The final sample consisted of 353 participants, of whom 36.5% were male. Their ages ranged from 14 to 22 years of age, with an average of 16.57 years (*SD*= 1.62). All the participants were asked whether they had some diagnosed mental disorder or whether they were receiving attention from the mental health services; all the participants negatively to both questions. The distribution of the participants according to gender and academic year can be seen in Table 1. No significant differences were found in the distribution (χ^2= 9.293, *df*= 4, *p*= .054).

Table 1
Distribution of the participants according to gender and education

Year	Gender				Total	
	Female		Male			
	n	%	*n*	%	*n*	%
3rd Secondary	40	11.35	30	8.45	70	19.85
4th Secondary	44	12.45	27	7.65	71	20.10
1st 'A' Levels	65	18.40	23	6.50	88	24.95
2nd 'A' Levels	43	12.18	36	10.20	79	22.38
Training Cycles	32	9.05	13	3.68	45	12.75
Total	224	63.5	129	36.5	353	100

Instruments

a) *Beck Cognitive Insight Scale* (BCIS; Beck et al., 2004), Spanish adaptation by Gutiérrez-Zotes et al. (2012). The scale measures how the subjects themselves measure their own judgement, how they can reflect upon unusual experiences they have, their ability to correct their own mistakes and their certainty concerning their own judgement. It consists of two dimensions: self-reflection (SR) and self-certainty (SC). Self-reflection (SR) is defined as the capacity to take into account and to evaluate alternative hypotheses in order to reach a reasoned conclusion; and self-certainty (SC), which is related to the accuracy of one's beliefs (Beck et al., 2004). The BCIS consists of 15 items with a Likert-type response scale of four alternatives going from 0 (completely disagree) to 3 (totally agree). The score for each dimension is calculated by adding the direct scores of the corresponding items, nine items for SR and six for SC. It also obtains a Composite Index (CI) of cognitive insight by subtracting the score in SC from the score in SR.. A greater CI value is considered to indicate greater cognitive insight. The internal consistency values (Cronbach's α) were .56 for SR and .60 for SC, slightly lower than those obtained in both the Spanish adaptation (Gutiérrez-Zotes et al., 2012) and the original scale (Beck et al., 2004). Although the internal consistency values are lower than the recommended values, they can still be considered acceptable for the purposes of this investigation as both subscales are made up of less than 10 items (Cortina, 1993; Holden et al, 1991).

b) *Abbreviated version of the Oviedo Questionnaire to evaluate Schizotypy* ("Versión abreviada del Cuestionario Oviedo para la evaluación de la esquizotipia"; Esquizo-Q-A; Fonseca-Pedrero et al., 2010). This self-reporting questionnaire allows us to evaluate schizotypy traits in adolescents in a fast and simple way. The Esquizo-Q-A is made up of 23 items, with a Likert type response scale of five alternatives going from 1 (totally disagree) to 5 (totally agree). The questionnaire has three subscales: 1) Distortion of reality (DR; α= .75), in which high scores indicate attenuated positive psychotic symptoms, reflected in alterations to one's sensorial perception, quasi-scientific thought processes of a referential nature with a paranoid tendency; 2) Negative dimension (ND; α= .68), in which high scores indicate restricted affectivity, emotional numbness and difficulties to experience pleasure in social situations and when faced with sensorial stimuli; and 3) Interpersonal disorganisation (ID; α= .71), in which high scores are indicative of strange behaviour, thoughts and language, with excessive social anxiety, a lack of intimate friends and a loss of self-confidence. The internal consistency values, measured through Cronbach's α, are similar to those obtained by Fonseca-Pedrero et al. (2010), in particular: DR α= .70, ND α= .67, and ID α= .71.

c) *Oviedo Scale of Response Infrequency* (INF-OVD; Fonseca-Pedrero et al., 2009). The INF-OVD allow to detect those participants who respond in a totally random, pseudo-random or dishonest way by answering items with only one possible answer. The scale consists of 12 items and a Likert type response scale of 5-points going from 1 (completely disagree) to 5 (completely agree). The participants with more than two incorrect answers are eliminated from the sample. The internal consistency (Cronbach's α) obtained in current study was .85.

Procedure

The questionnaires were administered during school hours in a single session lasting 20 to 30 minutes, in class groups of between 10 and 30 students. Permission was received from the management of the selected centres, who approved the project, and authorisation was also received from the parents and/or tutors of the students, as well as from the students themselves, who gave their written consent. The voluntary nature of their participation, their anonymity and the confidentiality of the response given, along with their use for solely research purposes, were assured at all times. The work presented, which is part of a wider study, was approved by the Ethics Committee for Clinical Research in the Cáceres Health Service Area, in accordance with the International Code on Medical Ethics of the WMA (Declaration of Helsinki 1975, revised in 2008).

Data analysis

Normality analyses were carried out on the variables using the Kolmogorov-Smirnov (K-S) test and the results were within the range of normal distribution. Reliability analyses were also carried out using the Cronbach's alpha values for all

the scales; descriptive and correlation analyses using Pearson's *r* test, as well as partial correlations. Finally, in order to determine the capacity of SR and SC for differentiating participants with high scores in schizotypy, we did so through ROC curves. Both the codification and the data analysis were carried out using the statistical package SPSS v.21.

Results

The average scores obtained by our participants are lower in SR and higher in SC, in comparison to other studies. Table 2 shows the descriptive statistics. The average score for CI is within the range of other studies.

Table 2
Descriptive statistics (means and standard deviations) of the Beck Cognitive Insight Scale

Studies	Self-reflection		Self-certainty		Composite index	
	M	SD	M	SD	M	SD
Current study	13.06	3.60	9.34	2.98	6.69	4.65
Beck et al. (2004) (ESQ)	14.01	4.84	6.99	3.5	7.02	5.51
Gutiérrez et al. (2012) (ESQ)	15.13	4.69	8.79	3.75	6.33	6.25
Warman & Martín (2006) (ESQ)	13.74	3.38	6.7	2.71	7.03	4.58
Buchy & Lepage (2015) (CS)	11.7	3.5	7.7	2.64	4.0	4.65
Martin et al. (2010) (NC)	14.41	4.36	7.02	3.36	7.39	4.79
dos Santos Kawata et al. (2021) (NC)	15.8	3.1	7.8	2.8	8.0	4.4
Penney et al. (2018) (CS)	10.7	3.5	7.5	2.8	3.2	4.6
Uchida et al. (2014) (CS)	11.53	3.07	4.37	2.35	7.6	3.62

Note: ESQ= Participants with schizophrenia; NC=non-clinical participants; CS= Healthy control participants.

We found a statistically significant direct relation between SR and the distortion of reality (DR) and interpersonal disorganisation (DI) sub-scales, corresponding to positive symptomatology, such as alterations in language and strange thoughts, social anxiety, lack of friends and loss of self-confidence; while an inverse relation was found between SR and the negative dimension (ND), related to an emotional state characterised by a restricted and blunted affection, as well as by difficulties to experience interpersonal and physical pleasure. We did not find statistically significant correlations between SC and the dimensions of the Esquizo-Q-A. On finding significant correlations of age with schizotypy, we carried out a partial correlation analysis controlling age; these results did not vary, although the values of *r* did increase slightly (see Table 3). We did not find statistically significant correlations between age and cognitive insight.

In order to measure the predictive capacity of the scores in cognitive insight on the score in schizotypy, using ROC curves, we analysed the sensitivity and specificity of the groups of vulnerability to schizotypy, established using the cut-off score of *P*80 (Fonseca-Pedrero et al., 2010).

Table 3
Correlations between age and dimensions of the BCIS and sub-scales of Esquizo-Q-A

BCIS	Age	Esquizo-Q-A					
		Distortion of reality		Negative dimension		Interpersonal disorganisation	
		r	$r_{partial}$	r	$r_{partial}$	r	$r_{partial}$
Self-reflection	-0,030	0,205**	0,206**	-0,302**	-0,311**	0,280**	0,285**
Self-certainty	-0,004	-0,013	-0,011	0,044	0,011	-0,067	0,062
Composite Index	-0,021	0,169**	0,167**	-0,256**	-0,249**	0,262**	0,262**
Age	--	-0,125*	--	-0,172**	--	-0,056	--

Notes: BCIS= Beck Cognitive Insight Scale; Esquizo-Q-A= Abbreviated version of the Oviedo Questionnaire to evaluate Schizotypy.
*p< .05; **p< .01.

In the analysis of the ROC curves, non-parametric for the sub-scale of Distortion of reality (see Figure 1), the area under the curve for SR was 0.648 (*p*< .000, 95% CI [.577-.720]); for SC, it was .518 (*p*= .632, 95% CI [.446-.590]); and for CI, it was .584 (*p*= .026, 95% CI [.514-.655]). For the negative dimension scale, the area under the curve for SR was .343 (*p*< .000, 95% CI [.272-.415]); for SC, the area under the curve was .532 (*p*= .401, 95% CI [.559-.605]); and for CI, it was .332 (*p*< .000, 95% CI [.267-.398]). For the Interpersonal disorganisation sub-scale (see Figure 2), the area under the curve for SR was .637; (*p*< .000, 95% CI [.564-.710]); for SC, it was .507 (*p*= .857, 95% CI [.434-.580]); and for CI, it was .609 (*p*= .005, 95% CI [.536-.683]).

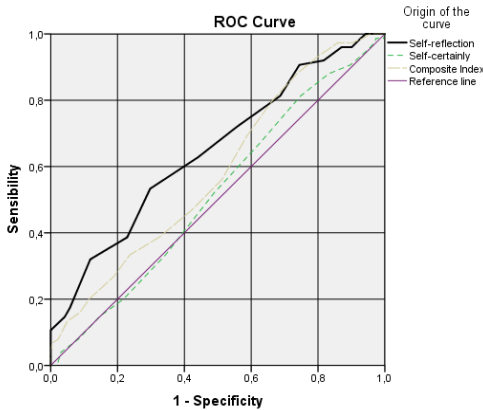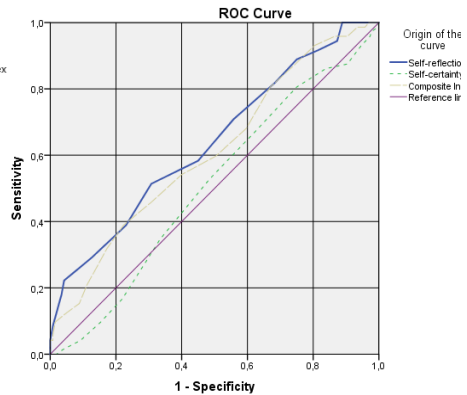| **Figure 1**	**Figure 2**
ROC curve for self-reflection and self-certainty as predictors of the Distortion of reality sub-scale of the Esquizo-Q-A	ROC curve for SR and SC as predictors of the Interpersonal disorganisation sub-scale of the Esquizo-Q-A

According to these results, the scores in SR and CI would allow us to correctly classify 65% and 58%, respectively, of the subjects as being at risk in the sub-scale of Distortion of reality; and 64% and 61%, respectively, of the subjects with at risk scores in the sub-scale of Interpersonal disorganisation. Both sub-scales are related to positive symptomatology. Table 4 shows the cut-off scores, taking into account the sensitivity and specificity values, for those scores that are within the confidence intervals.

Table 4

Cut-off points according to the values of sensitivity and specificity for SR and CI as high risk predictors in the Cognitive Distortion (DC) and Interpersonal disorganisation (ID) sub-scales of the Esquizo-Q-A

Predictor	Criterion	Cut-off point	Sensitivity	1 - Specificity	Youden Index
Self-reflection	Distortion of reality	12.5**	.720	.557	.277
		13.5	.627	.439	.066
		14.5*	.533	.295	.172
	Interpersonal disorganisation	12.5**	.708	.558	.266
		13.5	.583	.450	.033
		14.5*	.514	.308	.178
Composite Index	Distortion of reality	3.5**	.560	.511	.071
	Interpersonal disorganisation	3.5**	.597	.504	.101
		4.5*	.542	.400	.058

Note: *Score maximises sensitivity; **Score maximises both sensitivity and specificity.

Discussion

Cognitive insight is a metacognitive construct that is acquiring ever greater importance due to its usefulness in detecting vulnerability to psychotic disorders in at risk, non-clinical populations. The main objective of this study was to analyse the relation between cognitive insight and the dimensions of schizotypy in a sample of non-clinical adolescents, and to analyse the sensitivity and specificity of SR, SC and CI for differentiating subjects with scores of vulnerability in schizotypy.

The average scores obtained by our participants were lower in SR and higher in SC, compared to both those obtained in the original version (Beck et al., 2004) and the Spanish adaptation (Gutiérrez-Zotes et al., 2012). The average score in SR was lower than that obtained in the healthy control group of comparative studies and in studies with non-clinical participants (dos Santos Kawata et al., 2021; Martin et al., 2010; Penney et al., 2020; Uchida et al., 2014).

Our participants had less capacity to evaluate and take into account alternative hypotheses in order to reach a conclusion. However, they had greater accuracy concerning their beliefs and a different profile to that obtained in clinical samples, particularly the high SC (Warman & Martín, 2006). The absence of a mental disorder and the age of the participants are two factors that may be involved in this result.

As for the first hypothesis, the results do not allow us to confirm this, as they show a significant relation between SR and CI and the three sub-scales of Esquizo-Q-A, directly with distortion of reality and interpersonal disorganisation and inversely with the negative dimension. These results are partially convergent with those found by Engh et al. (2009) and Bora et al. (2007), but they are contradictory to those found by other works of research which conclude that there is a negative relation between SR and the positive symptoms (DR), and a direct relation between SC and the positive symptomatology (DR) (Beck et al., 2004; Bora et al., 2007; Lysaker et al., 2010; Penney et al., 2020; Vohs et al., 2015; Warman et al., 2007). We did not find significant correlations between SC and the dimensions of the Esquizo-Q-A that

did not coincide with previous studies (Pedrelli et al., 2004; Vohs et al., 2015); although the results tend towards a negative relation to the positive symptoms and a positive relation to the negative symptomatology.

There are very few works of research into cognitive insight in the non-clinical adolescent population, so the results obtained have to be compared to studies in adult populations and to those with different disorders, whether they are psychotic, schizoid, or affective, etc. The characteristics of the cognitive processes between both groups of subjects can show differences, related not only to the presence of a psychopathological diagnosis and its clinical implications (hospitalisations, treatment with psychotropic drugs, interventions, etc.); but also to age and the developmental moment. In this sense, during adolescence, changes occur in the frontal cortex that can affect the cognitive capacity for abstraction and self-reflection (Dumontheil, 2014; Sebastian et al., 2008). Furthermore, adolescents can show lower metacognitive skills as compared to young adults (do Santos Kawata et al., 2021). This, together with the introspective contents of the Scale itself (Van Camp et al., 2017), could explain these results.

As for the second hypothesis, we found that SR, as the capacity to evaluate and take into account alternative hypotheses in order to reach a reasoned conclusion, could be useful for differentiating, among non-clinical adolescents, those subjects with high risk scores in the sub-scales of Distortion of reality and Interpersonal disorganisation (positive symptomatology). However, it is not possible to confirm the second hypothesis, since the predictive capacity we found for SR is limited, and would correspond to a "weak" functioning of the test, according to Muñiz (2018). These results are partly in line with those studies which consider that cognitive insight can be useful for detecting non-clinical subjects with a risk of developing schizotypy symptomatology (Beck et al., 2004; Kao et al., 2011; Martin et al., 2010; Warman et al., 2007). However, they should be considered with caution and should await further research results.

Early detection in the general population of the presence of cognitive and metacognitive processes demonstrating a risk of psychotic experiences is highly useful when applied, as it allows us to develop prevention programmes. At the same time, it is necessary to adapt intervention programmes on cognitive insight that have been effective in patients with schizophrenia and other disorders (Birulés et al., 2020; Moritz et al., 2011; Philipp et al., 2019; Simón-Expósito & Felipe-Castaño, 2019) for their use with persons at risk or vulnerable to disorders of the schizophrenia spectrum.

This study also has some limitations. The transversal nature of the design of the research, which does not allow us to establish cause-effect relationships; as well as the problem inherent to the use of self-reporting and the strict comparison with other questionnaires, since there are few scales for evaluating schizotypy traits in the adolescent population and there is a wide-open debate on the number of related dimensions that can be evaluated within the construct (Fonseca-Pedrero et al., 2021). In addition, the use of different terms makes comparisons with previous studies more difficult, since several authors have used, indistinctly, the terms schizotypy, schizotypy traits, or attenuated psychotic experiences. Finally, the internal consistency values obtained in the Beck Cognitive Insight Scale should be

taken into account, as they can affect the utility of the instrument for its use in the non-clinical adolescent population (Engh et al., 2007).

Future studies should continue to delve into the relation between cognitive insight and the schizotypy personality traits in the general population as predictors of the vulnerability to developing symptoms, disorders and disturbances. It would also be necessary to review the content of the items in the Beck Cognitive Insight Scale and its adaptation to the introspective characteristics and experiences of adolescence and the non-clinical population so as to improve its reliability. Lastly, it would also be necessary to widen the sphere of study with longitudinal research work to describe cognitive insight throughout its development, including neuropsychological measures, and to replicate the study with clinical adolescent participants.

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