The CBQ-p: A confirmatory study on factor structure and convergent validity with psychotic-like experiences and cognitions in adolescents and young adults

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ABSTRACT. Il Cognitive Biases Questionnaire for psychosis (CBQ-p), recentemente sviluppato, è un questionario che misura distorsioni cognitive considerate fattori di vulnerabilità e di mantenimento specifici per sintomi psicotici, in particolar modo le convinzioni deliranti. Nel contesto italiano sono assenti strumenti di misura di questi aspetti e, inoltre, nessuno degli studi internazionali ha indagato la validità convergente con esperienze psicotiche sotto-soglia. Il presente studio ha indagato la struttura fattoriale della versione italiana del CBQ-p con analisi confermative in un gruppo di adolescenti e giovani adulti tratti dalla popolazione generale. Un ulteriore obiettivo è stato indagare la sua validità convergente con misure di salienza aberrante, distorsioni cognitive specifiche per i sintomi psicotici, confusione inferenziale ed esperienze psicotiche sotto-soglia. Trecentottantotto adolescenti e giovani adulti tratti dalla popolazione generale (età media = 19.22, 55% femmine) hanno compilato il CBQ-p, misure di distorsioni cognitive specifiche per i sintomi psicotici, rimuginio ed esperienze psicotiche sotto-soglia. È stata scelta una soluzione bifattoriale, composta dal fattore Sovrastima del pericolo e da Percezioni anomale, sulla base dello studio originale di validazione e dei risultati sull'affidabilità. In conclusione, la versione italiana del CBQ-p ha dimostrato adeguate proprietà psicometriche e validità convergente con esperienze psicotiche sotto-soglia.

SUMMARY. The Cognitive Biases Questionnaire for psychosis (CBQ-p) is a recently developed self-report measure assessing cognitive distortions relevant to psychotic symptoms and experiences, specifically for the onset and maintenance of delusional ideas. In Italy, there is a lack of assessment tools measuring these aspects. In addition, no international study investigated the relations of CBQ-p with subthreshold psychotic-like experiences. The current study assessed the factor structure of the Italian CBQ-p with confirmatory analyses in community adolescents and young adults. A further aim was to examine its convergent validity with measures of aberrant salience, cognitive biases specific to psychosis, inferential confusion, worry, and subthreshold psychotic-like experiences. Three hundred eighty-eight adolescents and young adults of the community (mean age= 19.22, 55% females) completed the CBQ-p, measures of cognitive distortions of psychosis, aberrant salience, inferential confusion, worry and subthreshold psychotic-like experiences. Confirmatory factor analysis, internal consistency and Pearson's correlations were computed. The Italian CBQ-p demonstrated good psychometric properties; the total scale and subscales reported convergent validity with subthreshold psychotic experiences.

Keywords: *Cognitive biases, Distortions, Cognitive Biases Questionnaire for psychosis, Psychotic experiences, Psychotic-like features, Adolescents*

INTRODUCTION

Research with population-based studies has shown that the dichotomous disease model of psychosis can be replaced with a more comprehensive model of psychosis as an extended phenotype across clinical and non-clinical manifestations, where at one end of the continuum lies schizophrenia, in the middle are non-psychotic psychological disorders with psychotic experiences (for example, panic disorders with derealisation or depression with psychotic features), and at the other extreme lie these experiences in subthreshold intensity among healthy, non-help-seeking individuals (van Os & Linscott, 2012). Schizophrenia only represents the poorest outcome segment of this wider spectrum of psychotic manifestations (van Os & Linscott, 2012). Indeed, subthreshold psychotic features are not uncommon in the general population: having one of psychotic symptoms was reported in about 25% (n = 5877) of the American population (Kendler, Gallagher, Abelson & Kessler, 1996) and 17.50% (n = 2548) of the German population (Spauwen, Krabbendam, Lieb, Wittchen & van Os, 2003). In an English-Italian cohort study (Ohayon, 2000), where hypnagogic and hypnopompic hallucinations were considered, the percentage increased to about 40% (n = 13057).

Subthreshold psychotic-like experience in the general population include a variety of subtypes, such as sensory experiences which are not shared by other present people, related to hearing sounds (voices, noises), unexplained visual experiences (visions, seeing ghosts), unusual bodily experiences (feeling touched), distorted self-experiences (a decreased ability to be affected by people and events, depersonalization experiences, feelings of derealisation), and perplexity (difficulty automatically grasping the meaning of the everyday situations) (Kelleher & Cannon, 2011).

In the last decade, there has been an increased attention by researchers and clinicians to cognitive factors potentially involved in psychotic symptoms and experiences (Garety, Bebbington, Fowler, Freeman & Kuipers, 2007). Contemporary cognitive models assume that biased reasoning processes contribute to the onset and maintenance of delusional ideas (Garety et al., 2005). Following the continuum of psychotic disorders, the knowledge of factors associated with psychotic experiences in the general population can inform prevention, suggesting the development of strategies, which could target these factors with the aim to prevent psychosis (van der Gaag, Nieman & van den Berg, 2013).

A variety of assessment tools has been designed to measure cognitive factors involved in psychotic symptoms in both clinical and non-clinical groups to inform clinical and prevention practice (Aardema, O'Connor, Emmelkamp, Marchand & Todorov, 2005; Cicero, Kerns & McCarthy, 2010; van der Gaag et al., 2013). The *Cognitive Biases Questionnaire for psychosis* (*CBQ-p*; Peters et al., 2014) is a recently developed self-report measure, aimed to assess cognitive distortions considered relevant in psychotic symptoms and experiences, specifically for delusional ideas. It is based on the *Cognitive Style Test* (*CST*; Blackburn, Jones & Lewin, 1986), which was designed to measure common thinking biases in depression. The original CST consisted of 30 vignettes describing everyday scenarios. Respondents are asked to select their own cognitive response to each scenario out of 4 possible reactions: a very negative one (scored 4), a somewhat negative (3), a somewhat positive (2) or a very positive (1). The CBQ-p is built on this format and is composed of 30 adapted vignettes relevant to psychotic symptoms/experiences. The scale measures five specific cognitive biases, that literature and clinical impressions of a large groups of researchers and therapists specialized in the field identified as maintenance factors of psychotic experiences/symptoms (Garety et al., 2007; Peters et al., 2014; van der Gaag et al., 2013): Jumping-to-conclusions (drawing firm interpretations based on scarce evidence), Intentionalising (interpreting events or behaviours as deliberate), Catastrophising (worst-case-scenario thinking), Emotional Reasoning (describing definite threatening meaning to one's feelings on a particular moment) and Dichotomous Thinking (i.e. "black or white" reasoning style). Fifteen of the 30 scenarios of the CBQ-p relate to "anomalous experiences", and the other 15 concern "threatening events". Respondents must select one out of three given statements as their most likely reaction to the presented scenario, with one possible choice identifying the presence of bias (scored 3), another the absence of bias (scored 1), and a third option the presence of bias with some doubt about it (scored 2).

To validate the CBQ-p, Peters and colleagues (2014) tested different models, including a single-factor, two-factor and a five-factor model. The model composed by five correlated factors comprised the five above-mentioned biases; the two-factor model instead consisted of the Anomalous experiences and Threatening events dimensions; finally, the model with a single factor represented a general interpretation bias. Findings showed that a 2-factor solution, with the two factors

correlated to each other, had the best fit to the data (Peters et al., 2014). Although the five-factor model demonstrated good fit as well, the different factors were highly correlated, and could hardly be differentiated empirically. In addition, good internal consistency was found for the first model (Cronbach's alpha coefficient was .89 for the total group). A point of criticism was, however, that scores on the CBQ-p were not associated with existing self-report measures and experimental tasks supposed to cover similar reasoning biases, such as the *Beads Task*, Catastrophising Interview (Startup, Freeman & Garety, 2007), *Ambiguous Intentions and Hostility Questionnaire* (*AIHQ*; Combs, Penn, Wicher & Waldheter, 2007), the *Dysfunctional Attitudes Scale* (*DAS*; Weissman & Beck, 1978). This evidence suggested that the CBQ-p maybe does not conceptualize reasoning, judgment or decision-making processes, but "rather taps into a different construct, perhaps a bias of interpretation" (Peters et al., 2014).

No study in the international literature investigated the relations of the CBQ-p with subthreshold psychotic-like experiences, despite the growing attention paid to these phenomena in the general population, not only in clinical groups. In addition, in the Italian context, a translated version of the CBQ-p does not still exist and there is a lack of assessment tools to measure cognitive biases specific to psychotic symptoms and experiences.

Starting from these points, the aim of the current study was to investigate the factor structure of the Italian version of the CBQ-p with confirmatory analyses in a group of adolescents and young adults of the community. Subsequently, reliability as internal consistency was assessed. A further aim was to examine its convergent validity with measures of aberrant salience, cognitive biases specific for psychosis, inferential confusion, worry, and subthreshold psychotic experiences. Both aberrant salience and inferential confusion have been shown to be associated specifically with psychotic and delusional symptoms and experiences in clinical and non-clinical groups (Aardema et al., 2005; Cicero et al., 2010).

METHOD

Participants and procedure

The total group consisted of 388 adolescents and young adults recruited from the Italian community. Mean age was 19.22 years (*SD* = 4.55, *range* = 14-35). Two hundred and thirteen (55%) were females. An overview of demographics is presented in Table 1. Participants were recruited from high schools and universities. Data were collected from October 2015 to November 2016. All the participants completed the questionnaires individually or in groups in classrooms. In accordance with the Ethical Principles of Psychologists and Code of Conduct (American Psychological Association, 2002), all the participants, who were included, provided written informed consent to participate in the study after having received a detailed description of the aims. For participants aged under 18 years, written informed consent was requested from both parents. Individuals with certified learning disabilities and mental retardation problems were excluded.

Table 1 – Sociodemographics of the community group of adolescents and young adults (n = 388)

	M (SD; range)	n (%)
Age (years)	19.22 (4.55; 19-35)	
Sex		
Females		213 (55)
Education		
Primary school license		0
Secondary school license		311 (80.2)
High school license		31 (8)
Degree		41 (10.6)
Ph.D.		5 (1.3)
Work status		
Student		339 (86.8)
Employed		42 (10.8)
Unemployed		7 (1.8)
Civil status		
Single		384 (98)
Married/cohabitant		3 (.9)
Separated		1 (.1)

Measures

A packet of the following self-report measures was administered.

– *Cognitive Biases Questionnaire for psychosis* (*CBQ-p*)
The CBQ-p (Peters et al., 2014) consists of 30 vignettes of everyday situations (half pleasant and half unpleasant). Respondents imagine themselves in each situation and choose 1 of 3 possible cognitive responses to the scenario. Each vignette requests a forced-choice response between 3 statements, illustrating absence of bias (score of 1), possible presence of bias (score of 2), and likely presence of bias (score of 3). The potential range of scores is 30-90.
Before proceeding to the translation of the measure, permission was obtained by the author who developed the scale (Prof. Emanuelle Peters, Department of Psychology, King's College, Institute of Psychiatry, London, UK). The translation process was carried out using a protocol conforming to international standards (Behling & Law, 2000), which included a forward and a backward translation. The forward translation was made by a native Italian-speaking clinical psychologist with excellent fluency in English, then checked by two Italian professional translators. The forward translator discussed the translation in consultation meetings with the professional translators. Subsequently, this version was translated back to English by a bilingual professional translator, who was blind to the original version of the CBQ-p. The back-translation was then compared with the original version, and discussed by the forward-translator with the back-translator in a consensus meeting, which generated the final Italian version of the CBQ-p.

– *Aberrant Salience Inventory* (*ASI*)
The Aberrant Salience Inventory (ASI; Cicero et al., 2010) is a 29-item self-report questionnaire with a dichotomous response format ("Yes" = 1, "No" = 0), which has five subscales measuring different aspects of the experience of aberrant salience. This is a cognitive factor believed to be specific to the development of delusional ideas (Kapur, 2003). The questionnaire assesses feelings of increased significance (e.g., "Do certain trivial things suddenly seem especially important or significant to you?"), sharpening of senses (e.g., "Do your senses ever seem especially strong or clear?"), impending understanding (e.g., "Do you sometimes feel like you are on the verge of something really big or important but you aren't sure what it is?"), heightened emotionality (e.g., "Do you go through periods in which you feel over-stimulated by things or experiences that are normally manageable?"), and heightened cognition (e.g., "Do you ever feel like the mysteries of the universe are revealing themselves to you?"). High scores indicate more intense aspects of aberrant salience. The ASI demonstrated good internal consistency and satisfactory convergent validity with measures of psychosis-proneness (Cicero et al., 2010), and the Italian version of the ASI had good internal consistency (Cronbach's alpha = .89). In the present study, internal consistency was good (Cronbach's alpha = .79).

– *Davos Assessment of Cognitive Biases Scale* (*DACOBS*)
The Davos Assessment of Cognitive Biases Scale (DACOBS; van der Gaag et al., 2013) was developed by the research group of Mark van der Gaag and colleagues (2013). It consists of 42 statements relating to seven subscales, constructed by means of exploratory factor analysis: (1) Jumping to conclusions bias, (2) Belief Inflexibility bias (i.e. confirmation bias), (3) Attention to threat bias, (4) External attribution bias, (5) Social cognition problems, (6) Subjective cognitive problems, and (7) Safety behaviours. Respondents score each statement using a 7-point rating scale, ranging from 1 ("Totally disagree") to 7 ("Totally agree") taking into account the past two weeks. Van der Gaag and colleagues (2013) found good reliability (Cronbach's alpha = .90), with the scale differentiating adequately between schizophrenia spectrum patients and healthy control individuals. High scores indicate more severe cognitive biases specific to psychotic symptoms. The Italian version (Pozza & Dèttore, submitted) has been translated according to forward- and backward-translation and showed a seven-factor solution with acceptable to good internal consistency (*range* of Cronbach's alpha = .75-.84). It showed satisfactory convergent validity with significant moderate correlations with the Paranoid Ideation and the Psychoticism subscales of the *Symptoms Checklist 90-Revised* (*SCL-90-R*; Derogatis, 1992). In the current study, internal consistency was good (Cronbach's alpha = .84).

– *Inferential Confusion Questionnaire-Extended Version* (*ICQ-EV*)
The ICQ-EV (Aardema al. 2010) is a 30-item questionnaire on a 6-point Likert scale ("Strongly disagree" = 1, "Strongly agree" = 6) to measure inferential confusion tendencies.

It showed excellent internal consistency (Cronbach's alpha = .96) and strong correlations with OCD symptoms beyond the effects of negative affect and obsessive beliefs (Aardema, Trihey, Kleijer, O'connor & Emmelkamp, 2006). Inferential confusion represents a cognitive factor believed to be associated with delusional thinking (Aardema et al., 2005) as patients with delusional disorders reported higher scores on this measure compared with non-clinical controls. High scores on the ICQ-EV represent an overreliance on imagination, a distrust of the senses, and a tendency to confuse imagination with reality. The Italian version (Pozza, Torniai & Dèttore, submitted) showed excellent internal consistency (Cronbach's alpha = .97). In the current study, internal consistency was excellent (Cronbach's alpha = .92).

– *Penn State Worry Questionnaire* (*PSWQ*)
The PSWQ (Meyer, Miller, Metzger & Borkovec, 1990) is a self-report measure, designed to cover aspects of clinically significant worry, specifically the tendency, intensity, and uncontrollability of worry. It consists of 16 items rated on a 5-point Likert scale, with values ranging from 1 ("Not at all typical of me") to 5 ("Very typical of me"). Meyer and colleagues (1990) conducted a series of studies evidencing very good or excellent internal consistency (alpha = .88-.95), good test-retest reliability (r = .74-.92), and good convergent and divergent validity in clinical and non-clinical samples. High scores indicate more intense clinical worry. The Italian version (Morani, Pricci & Sanavio, 1999) had good internal consistency. In the current study, internal consistency was good (Cronbach's alpha = .86).
– *Screening for Psychotic Experiences* (*SPE*)
The SPE (Magnani et al., 2010) is a self-report scale, composed by 20 items, which represents a shorter version of the *Prodromal Questionnaire* (*PQ*; Loewy, Bearden, Johnson, Raine & Cannon, 2005), a 92-item self-report screening instrument, aimed to identify individuals needing for further diagnostic assessments of at-risk-mental states of psychotic disorders and symptoms. The SPE covers subthreshold experiences and feelings typical of psychotic symptoms, that need for further assessments, such as self-reference ideas, delusional perceptions, self-neglecting, depersonalization/derealization (eg, "I think that people look at me or talk about me"). All of these experiences have been found to be predictors of psychotic symptoms and have been defined as "early initial prodromal states" (Yung et al., 1998). Respondents are asked to give an answer based on a true/false response format, where "True" is scored as 1 and "False" as 0. High scores suggest more intense subthreshold psychotic experiences. The SPE demonstrated good internal consistency (alpha = .79) in a large group of Italian adolescents (Magnani et al., 2010). In the current study, internal consistency was acceptable (alpha = .77).

Statistical analysis

The distributional properties of the CBQ-p items were assessed by inspecting the skewness and kurtosis indices of the items' distributions. Subsequently, to examine fit of the data to the factor structure, confirmatory factor analysis (CFA) was carried using a structural equations modelling (Bollen, 1989). As reported in Peters and colleagues (2014), three models were tested: a two-correlated, five-correlated, and a single-factor models, respectively.

To evaluate goodness of fit of the model to the data, the following indices recommended by Hu and Bentler (1999) were adopted: the Adjusted Goodness-of-Fit Index (AGFI), the Goodness of Fit Index (GFI), the Bentler-Bonett Normed Fit Index (NFI; Bentler & Bonett, 1980), the Bollen's Relative Fit Index (RFI; Bollen, 1986). For these indices, values ranging from .95 and 1 represent excellent fit, values ranging from .90 and .95 good fit. In addition, the Root Mean Square Residual (RMR) was considered; values less than .08 represent acceptable fit, and those less than .05 represent good fit.

Reliability was examined as internal consistency using Cronbach's alpha coefficients and assessed according to Nunnally and Bernstein's guidelines (1994) (alpha>.70 = acceptable, alpha>.80 = good, alpha>.90 = excellent).

Independent sample t-tests were calculated, in order to compare means of male and female subgroups on the CBQ-p total and subscales. Effect sizes were computed as Cohen's d indices. Convergent validity was examined investigating the correlations between the CBQ-p scores and measures of cognitive biases involved in psychotic symptoms, aberrant salience, inferential confusion, subthreshold psychotic-like characteristics, and worry. Significance levels were set at a Bonferroni-corrected alpha value (p<.05/17 = .003) due to the number of correlations performed. To compare the bivariate correlation coefficients, effect sizes were calculated as Fisher's z coefficients. Power calculations were run for this analysis:

for a medium effect size, 80% power, and significance set at the level described above, the required sample size for bivariate correlations was 152.

The statistical analysis was conducted using the SPSS software version 21.00 and the AMOS software.

RESULTS

Confirmatory factor analysis (CFA)

Before conducting the CFA, the assumption of multivariate normality was investigated by the inspection of kurtosis and skewness indices. An absolute value on these indices falling out of the recommended range between −1 and +1, suggests a substantial deviance from normal distribution (Muthén & Kaplan, 1985). Twenty items (items 1, 2, 3, 5, 6, 8, 10, 11, 14, 16, 17, 18, 20, 22, 23, 24, 27, 28, 29, 30) showed kurtosis or skewness values out of the range, suggesting that data for these items were not normally distributed. Thus, the estimation method of Unweighted Least Squares was employed.

Models with two and five correlated factors were tested, as reported in the original validation study (Peters et al., 2014). Finally, a model with a single factor was assessed. The models with a single, two correlated factors or five correlated factors showed good or acceptable fit. As compared with the other models, the model with five correlated factors showed a slightly better fit (GFI = .95; AGFI = .94; NFI = .88; RFI = .87; RMR =.022).

In the single-factor model, nine items (1, 4, 5, 7, 9, 17, 19, 21, 29) had factor loadings lower than .30, in the five-factor model seven items had loadings below this cut-off score (1, 4, 5, 17, 19, 21, 29). In the model with two correlated factors, six items showed loadings lower than .30 (1, 4, 5, 29 for the Threat estimation factor; 17, 21 for the Anomalous perceptions factor). An overview of fit indices and factor loadings for all the three tested models is presented in Table 2 and in Table 3, respectively.

Internal consistency

Internal consistency for the CBQ-p total scores was good (Cronbach's alpha estimate = .83) according to Nunnally and Bernstein (1994). The CBQ-p Threat estimation subscale yielded only a modest internal consistency with a Cronbach's alpha estimate of .65 (*range* of item-total correlations = .10-.42). The CBQ-p Anomalous perception showed acceptable internal consistency with a Cronbach's alpha value of .75 (*range* of item-total correlations = .10-.54).

Thus, based on the original validation study (Peters et al., 2014) and the results from internal consistency and CFA, where either the five-, the two- and the single-factor models had good fit, a two-factor model was considered as preferred.

Differences between groups

Results of independent-sample t-tests indicated no difference for gender on the CBQ-p total and the two CBQ-p subscales (*range* of t = .80-1.39, p-values = .18-.42, *range* of Cohen's d = .10-.12). An overview of mean scores in the total group and in the two subgroups divided by gender is presented in Table 4.

Table 2 – Fit indices of the Italian CBQ-p factor models (n = 388)

Tested models	χ^2	df	p-value	χ^2/df	GFI	AGFI	NFI	RFI	RMR
One-factor model	769.56	405	.0001	1.90	.94	.94	.87	.86	.023
Two correlated factor model	575.61	402	.0001	1.43	.95	.94	.87	.86	.023
Five correlated factor model	671.00	395	.0001	1.69	.95	.94	.88	.87	.022

Note. CBQ-p = Cognitive Biases Questionnaire for psychosis; GFI = Goodness of Fit Index; AGFI = Adjusted Goodness-of-Fit Index; NFI = Bentler-Bonett Normed Fit Index; RFI = Bollen's Relative Fit Index; RMR = Root Mean Squared Residual.

Table 3 – Factor loadings for the three tested models of the CBQ-p (n = 388)

CBQ-p items	One factor	Two correlated factors		Five correlated factors				
		TE	AP	Int	Cat	DT	JTC	ER
Item 1	.04	.10		.02				
Item 2.	.41		.49		.42			
Item 3.	.57		.68	.55				
Item 4.	.18	.19			.25			
Item 5.	.07	.10				.10		
Item 6.	.33		.36				.39	
Item 7.	.25	.30			.29			
Item 8.	.47		.50					.49
Item 9.	.25	.30					.33	
Item 10.	.49		.52		.52			
Item 11.	.41	.44				.39		
Item 12.	.37	.41			.41			
Item 13.	.41	.43						.38
Item 14.	.35		.39			.34		
Item 15.	.44	.46				.44		
Item 16.	.40		.43					.43
Item 17.	.17		.20				.21	
Item 18.	.51	.54					.55	
Item 19.	.25	.30						.24
Item 20.	.71		.80	.77				
Item 21.	.06		.10				.18	
Item 22.	.60	.71		.68				
Item 23.	.52		.56	.56				
Item 24.	.47	.50						.49
Item 25.	.37		.41		.42			
Item 26.	.41		.45					.42
Item 27.	.42		.47			.43		
Item 28.	.51	.57		.56				
Item 29.	.06	.10					.14	
Item 30.	.38		.41			.37		

Note. TE = threatening events; AP = anomalous perceptions; Int = intentionalising; Cat = catastrophising; DT = dichotomous thinking; JTC = jumping to conclusions; ER = emotional reasoning.

Table 4 – Mean scores on the CBQ-p total and subscales in the total group and in the two subgroups divided by sex

	Total group (n = 388)	Males (n = 175)	Females (n = 213)		
	M (SD)	M (SD)	M (SD)	$t_{(385)}$	Cohen's d
CBQ-p total	46.12 (7.60)	46.63 (8.06)	45.71 (7.21)	1.39	.12
CBQ-p Threat estimation	24.15 (3.97)	24.35 (4.03)	24.02 (3.92)	.80	.08
CBQ-p Anomalous perception	21.94 (4.32)	22.27 (4.73)	21.68 (3.96)	1.33	.10

Note. CBQ-p = Cognitive Biases Questionnaire for psychosis.

Convergent validity with psychotic-like experiences and cognitive factors

Scores on the CBQ-p total moderately correlated with scores on DACOBS belief inflexibility, external attribution bias, subjective cognitive problems, social cognition bias and safety behaviours scales, SPE, ASI, PSWQ and ICQ-EV, weakly with scores on DACOBS attention for threat and jumping to conclusions scales.

Scores on CBQ-p *Threat estimation* and *Anomalous perception* subscales moderately correlated with scores on DACOBS belief inflexibility, external attribution bias, subjective cognitive problems, social cognition bias and safety behaviours scales, SPE, and ICQ-EV, weakly with ASI, DACOBS attention for threat and jumping to conclusions scales. In addition, while scores on CBQ-p *Threat estimation* subscale moderately correlated with PSWQ scores, scores on CBQ-p *Anomalous perception* subscale weakly correlated with PSWQ scores.

CBQ-p total scores had the highest correlations with scores on DACOBS Safety behaviours scores (Fisher's z =.63), DACOBS External attribution bias (Fisher's z = .45), ICQ-EV (Fisher's z = .54), SPE (Fisher's z = .55). CBQ-p Threat estimation subscale scores had the highest correlations with scores on DACOBS Safety Behaviours (Fisher's z = .44), SPE (Fisher's z = .47), ICQ-EV (Fisher's z = .51), and PSWQ scores (Fisher's z = .40). CBQ-p Anomalous perception scores had the highest correlations with scores on DACOBS Safety behaviours scores (Fisher's z = .66), DACOBS External attribution bias (Fisher's z = .44), SPE (Fisher's z = .46) and ICQ-EV (Fisher's z = .4). An overview of bivariate Pearson's correlation coefficients between scores on CBQ-p total/subscales and those on the other measures is presented in Table 5.

DISCUSSION

Synthesis of results

The current study investigated the psychometric properties of the Italian version of the CBQ-p, a self-report measure designed to assess cognitive biases related to psychotic symptoms and experiences. In the Italian literature, there is a lack of measures assessing these aspects. Current findings expanded previous knowledge on this measure, since a strength of the study was that it investigated the factor structure on adolescents and young adults, who are typically in an age range considered as a key stage for early identification of psychotic-like experiences. Starting from a theoretical model, where psychotic symptoms lie on a continuum (van Os & Linscott, 2012), this study was the first one investigating the relations of the CBQ-p with subthreshold psychotic symptoms and experiences and with other cognitive factors specific to psychosis, such as inferential confusion and aberrant salience.

Confirmatory analyses suggested that five-, two- and single-factor models yielded equally good fit to the data. Despite the model with five correlated factors evidenced a very slightly better fit compared with the other ones, and also the one with a single factor had good fit, the model including two correlated factors was considered as preferred for the Italian CBQ-p on the basis of evidence reported in the original validation study of the measure (Peters et al., 2014), where a

Table 5. – Bivariate Pearson's correlation coefficients (Fisher's z) between CBQ-p total and subscales and the other measures (n = 388)

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.
1. CBQ–p Threat estimation	.68** (.83)	.91** (1.51)	.40** (.42)	–.01 (–.01)	.30** (.31)	.20** (.20)	.36** (.38)	.36** (.38)	.39** (.41)	.44** (.47)	.47** (.51)	.51** (.56)	.27** (.28)
2. CBQ–p Anomalous perception		.92** (1.59)	.21** (.21)	.05 (.05)	.35** (.37)	.18** (.18)	.41** (.44)	.27** (.28)	.35** (.37)	.58** (.66)	.43** (.46)	.37** (.39)	.26** (.27)
3. CBQ–p total			.34** (.35)	.03 (.03)	.36** (.38)	.21** (.21)	.42** (.45)	.34** (.35)	.40** (.42)	.56** (.63)	.50** (.55)	.49** (.54)	.29** (.30)
4. PSWQ				–.25** (.26)	.10 (.10)	.34** (.35)	.37** (.39)	.41** (.44)	.50** (.55)	.23** (.23)	.44** (.47)	.51** (.56)	.21** (.21)
5. DACOBS Jumping to conclusions					.23** (.23)	.14** (.14)	.20** (.20)	–.04 (.04)	–.08 (.08)	0.02 (.02)	–.10 (.10)	–.09 (–.09)	.0 (.03)
6. DACOBS beliefs inflexibility bias						.23** (.23)	.51** (.56)	.25** (.26)	.34** (.36)	.41** (.44)	.18 (.18)	.35** (.379)	.18 (.18)
7. DACOBS Attention for threat bias							.33** (.34)	.42** (.45)	.25** (.26)	.24** (.25)	.24** (.25)	.49** (.54)	.32** (.33)
8. DACOBS external attribution bias								.47** (.51)	.41** (.44)	.40** (.42)	.33** (.34)	.41** (.44)	.15 (.15)
9. DACOBS social cognition problems									.51** (.56)	.23** (.23)	.33** (.34)	.64** (.76)	.35** (.36)
10. DACOBS subjective cognitive problems										.31** (.32)	.41** (.44)	.63** (.74)	.35** (.36)
11. DACOBS safety behaviours											.31** (.32)	.34** (.35)	.17 (.17)
12. SPE												.73** (.93)	.52** (.58)
13. ICQ–EV													.59** (.68)
14. ASI													1

Note. ASI = Aberrant Salience Inventory, CBQ-p = Cognitive Biases Questionnaire for psychosis, DACOBS = Davos Assessment of Cognitive Biases Scale, ICQ-EV = Inferential Confusion Questionnaire-Extended Version, PSWQ = Penn State Worry Questionnaire, SPE = Screening for Psychotic Experiences.
** $p<.003$.

two-factor model was chosen as more reliable. The two-factor model was preferred also based on the factor loadings, which were higher than .30 for all the items except for six items, while nine and seven items had loadings lower than this value in the single- and five-factor models. Evidence that the items 1, 4, 17, 19 had insufficient loadings in all the three models of the Italian CBQ-p appeared quite consistent with evidence of factor loadings found in the English version (Peters et al., 2014), where factor loadings of these items ranged from .35 to .28, then were very close to the cut-off score of .30. Presence of factor loadings lower than .30 on six items in the two-factor solution was recognized as a limitation of the Italian CBQ-p, requiring further investigations in future studies; however, these items were not removed, in light of results from reliability analysis, where Cronbach's alpha estimates remained between .57 and .64 if each of these items were deleted for the *Threat estimation* factor and between .71 and .74 if deleted for the *Anomalous perception* factor.

Indeed, internal consistency appeared good for the CBQ-p total scale (alpha = .83) and was in line with the value observed in the original study, where it was equal to .89 (Peters et al., 2014). According Peters and colleagues' definition (2014), the single factor of the CBQ-p total scale was considered as a general interpretation bias including features related to the two hypothesized cognitive distortions specific to psychotic symptoms and experiences. The two factors were loaded by the same items and were defined using the same labels as in the study of Peters and colleagues (2014): *Threat estimation* and *Anomalous perception* subscales. Regarding internal consistency of the subscales, while the *Threat estimation* subscale showed modest internal consistency, the *Anomalous perception* subscale had acceptable internal consistency.

Another finding was that no gender-related difference was found on cognitive distortions measured by the CBQ-p total and subscale scores. This evidence appeared somewhat in contrast with a commonly found result in the literature, where males typically showed an increased vulnerability for psychotic experiences (Barajas, Ochoa, Obiols & Lalucat-Jo, 2015). Thus, while gender-related differences were observed for some of the specific biases, no difference was found on the CBQ-p total scores suggesting that males and females do not endorse differently a general interpretation bias specific to psychotic-like experiences.

Regarding convergent validity, CBQ-p total and subscales all had significant correlations with measures of cognitive distortions specific to psychotic symptoms and experiences, aberrant salience, inferential confusion, psychotic-like experiences and worry. CBQ-p total was the scale of the CBQ-p with the highest correlations with subthreshold psychotic experiences, followed by *Threat estimation* and *Anomalous perceptions*. In addition, none of the CBQ-p scales had significant correlations with jumping to conclusions bias measured by the DACOBS. This finding appeared in line with the evidence reported in the original study of the CBQ-p, where this scale had not robust correlations with self-report measures or experimental tasks related to cognitive biases, such as the Dysfunctional Attitudes Scale (Peters et al., 2014). Considering the DACOBS subscales, the two cognitive distortions, measured by the CBQ-p, had the highest correlations with safety behaviours assessed by the DACOBS. Overall, it could be hypothesized that a general interpretation bias measured by the CBQ-p is more specific to psychotic-like experiences (Fisher' s $z = .55$) than the different cognitive biases measured by its subscales.

Among the cognitive biases measured by the DACOBS, this general bias appeared more strongly correlated with safety behaviours (Fisher' s $z = .63$), and more strongly with inferential confusion (Fisher's $z = .54$) than salience (Fisher's $z = .30$) and worry (Fisher's $z = .35$). On one hand, this finding supported convergent validity of the CBQ-p, as inferential confusion is a cognitive construct associated with psychotic symptoms and experiences (Aardema et al., 2005); on the other hand, it was in contrast with evidence indicating that salience is a cognitive factor specific to psychotic features (Kapur, 2003). The current results, however, confirmed that the general interpretation bias measured by the CBQ-p, was specific to psychotic experiences rather than other constructs such as worry.

Considering the CBQ-p subscales, both *Threat estimation* and *Anomalous perception* had higher correlations with inferential confusion than aberrant salience. This finding could be explained by the fact that young individuals with subthreshold psychotic features, who frequently experience emotional states (e.g., anxiety, negative mood), would expect dangers more likely as consequences of their negative states; this could make certain dangerous stimuli salient leading the individuals to develop a catastrophising reasoning as a result of a vicious cycle. Another important finding was that *Threat estimation* had a higher correlation with worry than *Anomalous perceptions*, confirming that the first factor covers aspects more closely related to thinking (cognitive) processes, focusing on future dangers and negative events

than *Anomalous perceptions*. *Threat estimation* is a common cognitive bias among many of mental symptoms, including not only psychotic features, but also anxiety and depression symptoms (Beck & Clark, 1988). Overall, it could be stated that both the cognitive biases measured by the CBQ-p were related to subthreshold psychotic experiences. Moreover, *Anomalous perception* was more closely related to safety behaviours than *Threat estimation*, suggesting that when the young individual experiences more frequently anomalous perceptions, is more likely to adopt safety behaviours in order to cope with them than adopting them to manage threat estimation.

Limitation and conclusions

Some limitations should be considered. First, the study did not use a clinical group with individuals suffering from psychotic disorders. In addition, the use of non-help-seeking participants prevented to draw firm conclusions about the factor structure of the CBQ-p in help-seeking young individuals at risk of psychosis for subthreshold psychotic symptoms (Yung et al., 1998, 2005, 2006). Despite the use of a screening measure for psychotic experiences, the study did not use a semi-structured interview for subthreshold psychotic symptoms, such as the Comprehensive of At Risk Mental States (CAARMS; Yung et al., 2005). Future research should evaluate the factor structure of the CBQ-p in young individuals seeking professional help at mental health centres and reporting subthreshold psychotic symptoms measured by the CAAMRS (Yung et al., 2006).

In addition, it could be interesting to compare individuals with subthreshold psychotic symptoms screened through interviews with a group of non-clinical controls, and a group of patients with full psychotic disorders. Another critical point was the internal consistency values for four subscales of the CBQ-p except intentionalising subscale, which resulted poor; this limitation should be further investigated in future research.

Finally, further investigations could assess predictive validity of the CBQ-p examining whether higher scores would predict the onset of a psychotic episode in help-seeking individuals for subthreshold symptoms through long-term evaluations (e.g., one-year follow-up).

In conclusion, the current study expanded knowledge on the cognitive biases specific to psychotic symptoms and experiences in the Italian context, demonstrating that the CBQ-p is a self-report questionnaire with good psychometric properties and convergent validity with constructs related to psychotic symptoms and experiences.

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