NÖRO PSİKİYATRİ ARŞİVİ
ARCHIVES OF NEUROPSYCHIATRY

RESEARCH ARTICLE

Arch Neuropsychiatry 2024;61:324–331
https://doi.org/10.29399/npa.28751

Reliability and Validity of the Turkish versions of the Davos Assessment of Cognitive Biases Scale (DACOBS) and Cognitive Biases Questionnaire for Psychosis (CBQp)

Şükrü Alperen Korkmaz[1], İlkay Keleş Altun[2], Serap Sağbaş[1], Fatmagül Eda Köksalan[1], Murat İlhan Atagün[1]

[1]Çanakkale Onsekiz Mart University Faculty of Medicine, Department of Psychiatry, Çanakkale, Türkiye
[2]Bursa Yüksek İhtisas Training and Research Hospital, Department of Psychiatry, Bursa, Türkiye

ABSTRACT

Introduction: Cognitive biases can be defined as dysfunctional patterns of thought formation that lead to incorrect conclusions and abnormal perceptions and are critical factors in the development and maintenance of psychosis. Two self-report measures assessing cognitive biases in psychosis spectrum disorder (PSD) have recently been developed: the Davos Assessment of Cognitive Biases Scale (DACOBS) and the Cognitive Biases Questionnaire for Psychosis (CBQp). This study aimed to validate the Turkish versions of the DACOBS and CBQp.

Methods: The sample consisted of 171 patients with PSD and 162 age and sex-matched healthy controls (HC). We investigated I) the factor structure with confirmatory factor analysis (CFA), II) the reliability (internal consistency and test-retest reliability), III) discriminative power, IV) convergent validity, and V) the concurrent validity of DACOBS and CBQp.

Results: The 7-factor solution for DACOBS, similar to the original study, and the 5-factor solution for CBQp provided the best fit. DACOBS and CBQp total and their subscale scores showed good internal consistency and test-retest reliability. DACOBS and CBQp total and their subscale scores could differentiate between PSD patients and HCs when controlling for age, sex, and education. DACOBS and CBQp showed a positively moderate correlation. DACOBS and CBQp scores were associated with psychotic symptoms in PSD patients and positive psychic experiences in HCs.

Conclusions: Both the DACOBS and the CBQp have good psychometric properties and are suitable instruments for assessing cognitive biases in the Turkish population. The Turkish versions of the DACOBS and CBQp were as reliable and valid as the original.

Keywords: Cognitive bias, reliability, validity, psychosis spectrum disorders, schizophrenia

Cite this article as: Korkmaz ŞA, Keleş Altun İ, Sağbaş S, Köksalan FE, Atagün Mİ. Reliability and Validity of the Turkish versions of the Davos Assessment of Cognitive Biases Scale (DACOBS) and Cognitive Biases Questionnaire for Psychosis (CBQp). Arch Neuropsychiatry 2024; 61:324–331.

INTRODUCTION

Psychosis spectrum disorders (PSD) are chronic mental illnesses that feature positive and negative symptoms, disorganized behavior, and cognitive impairments, often beginning in early life and significantly impacting psychological well-being and functioning (1,2). In addition to these symptoms, patients with PSD show marked cognitive biases, defined as systematic errors in cognitive processing and content in certain situations (3). Consistent evidence indicates a strong association between cognitive bias and psychopathology in PSD (4,5). Cognitive limitations and biases also play an essential role in the formation of delusions and hallucinations (6–8). Cognitive biases do not affect processing capacity; however, cognitive processes are sometimes biased in judgment, leading to distorted perceptions, illogical interpretations, or general irrationality (9,10).

Highlights

- **Several cognitive biases (CB) have been linked to psychosis.**
- **Measuring CB in patients with psychotic disorders is vital.**
- **Both the DACOBS and the CBQp are valid tools for measuring CB.**
- **Both Turkish versions of DACOBS and CBQp have good psychometric properties.**
- **Both Turkish versions of DACOBS and CBQp are valid and reliable instruments.**

Cognitive biases are dysfunctional thinking patterns that lead to incorrect inferences and abnormal perceptions (11). They affect various cognitive domains, including attention, interpretation, decision-making, and memory (12). Several cognitive biases have been linked to delusions and psychosis (4,13). Some cognitive biases observed in PSD include "jumping to conclusions (JTC)," "inflexibility of beliefs," "attention to threat bias," "attributional bias," "emotion-based reasoning," and "bias against disconfirmatory evidence (BADE)" (5,11,14–17). Jumping to

Correspondence Address: Murat İlhan Atagün, Department of Psychiatry, Çanakkale Onsekiz Mart University Faculty of Medicine, 17000 Çanakkale/Merkez, Türkiye • **E-mail:** murat.atagun@comu.edu.tr
Received: 09.03.2024, **Accepted:** 22.04.2024, **Available Online Date:** 19.11.2024

conclusions is defined as the tendency to reach a decision quickly with fewer data without considering alternative explanations and is observed in 1/3–2/3 of delusional patients (5,18). Bias against disconfirmatory evidence is the tendency to disregard non-confirmatory information when evaluating one's own beliefs and may distinguish patients with PSD from HC (17,19). Belief inflexibility is a challenge in the metacognitive skill of contemplating one's own delusional convictions, revising them in light of evidence, and formulating and evaluating alternatives, which may contribute to entrenching false ideas (i. e., delusions) (20,21). Attributional bias is the tendency to attribute negative events to others rather than to the context of a social situation and is associated with psychosis (22,23). Attention to threat bias refers to the tendency to focus on threatening stimuli more than neutral ones. Anxious individuals often exhibit this type of attentional bias towards threatening information sources (24,25). Emotion-based reasoning defines a precise meaning to one's feelings at a given moment. Anything that is felt without any conditions and without the need for supporting facts or evidence is accepted as accurate (26).

Although some well-structured experimental tasks (27,28) assess cognitive biases in PSD, they are complex and time-consuming, limiting their use in clinical practice and research. For these reasons, two new self-report instruments have recently been developed to assess cognitive biases in psychosis: the Davos Assessment of Cognitive Biases Scale (DACOBS) and the Cognitive Biases Questionnaire for Psychosis (CBQp).

DACOBS was developed by van der Gaag et al. in 2013 (9). Consisting of 42 items, the scale has seven subscales: "jumping to conclusions bias," "belief inflexibility bias," "attention to threat bias," "external attribution bias," "social cognition problems," "subjective cognitive problems," and "safety behaviours." In the original study, it was determined that jumping to conclusions bias was correlated with the "Beads task" (27); Belief Inflexibility bias was correlated with the "Dogmatism Scale" (29); attention to threat bias was associated with "Green Paranoid Thought Scale part A"; External attribution bias was correlated with "Green Paranoid Thought Scale part B" (30); and safety behaviours were correlated with "Safety Behaviors Questionnaire-Paranoid Delusions" (31). DACOBS has been translated into Flemish, Polish, Italian, Spanish, and French and validated in their populations (13,32–35). Satisfactory internal consistency and convergent validity were determined for all versions of the DACOBS in the other languages.

The CBQp was developed by Peters et al. (36). The scale consists of 30 vignettes, 15 related to anomalous perception and 15 about threatening events. It evaluates five different cognitive biases: "intentionalizing (interpreting events or behaviours as deliberate)," "catastrophising (thinking of worst-case scenarios)," "dichotomous thinking (thinking of all or nothing)," "jumping to conclusions," and "emotion-based reasoning (thinking of emotions as evidence for the truth)." CBQp has been reported to correlate with DACOBS (9,32). The CBQp has been translated into Flemish, Indonesian, Japanese, and Spanish and validated in their populations (32,37–39). Good psychometric properties have been found for all versions of the CBQp in other languages.

Currently, no validated Turkish self-report scale can assess cognitive bias in psychoses. Thus, this study aimed to develop Turkish versions of the DACOBS and CBQp and validate them among Turkish subjects by examining a) the factor structure, b) the reliability of both scales, c) the discriminative validity of differentiating patients from healthy subjects, d) the calculation of the convergent validity of the CBQp and DACOBS based on their correlations, and e) the relationships between cognitive biases and psychotic symptoms in PSD and psychotic-like experiences in healthy subjects.

MATERIAL AND METHODS

Participants and Procedure

One hundred seventy-one patients, comprising inpatients and outpatients, diagnosed with PSD based on DSM-5 through clinical interviews with two psychiatrists, were included in the study between June 2023 and January 2024. The study had 162 healthy controls (HC). Total number of participants was 333. Researchers informed the patients about the study, and the patients were recruited from Çanakkale Onsekiz Mart Üniversitesi Hastanesi and Community Mental Health Centre, SBÜ Bursa Yüksek İhtisas Training and Research Hospital. The HC group was selected from university working staff, students, and family members and called through social media. All participants were aged 18 years or older, had no neurological diseases or substance use disorders (except smoking), and were competent in Turkish.

We translated the DACOBS and CBQp into Turkish using the direct and inverse translation method (translation-back-translation) to develop Turkish versions. First, approval was obtained from the original authors (M. Van der Gaag and E. Peters). Second, two researchers (ŞAK and MİA) independently translated the original scales into Turkish. These translations were then reviewed by two psychiatrists fluent in English and Turkish (not involved in the study). The translation forms were discussed; necessary corrections were made regarding meaning, cultural appropriateness, and grammar, and the translation forms were merged into a single form. Subsequently, the translation form was translated back into English by an English-language professional blinded to the scales, and a back-translation form was developed. An English-language professional also assessed the translation and back-translation forms for linguistic equivalence. Twelve psychiatrists examined the content validity of the Turkish version. The Turkish version was found to have good content validity. Finally, the translated and back-translated forms were sent by e-mail to the authors who developed the scales, and approval was obtained after necessary revisions.

The DACOBS and CBQp were administered to all participants, together with the Positive and Negative Syndrome Scale (PANSS) and Global Assessment of Functioning Scale (GAF) in patients with PSD and the Community Assessment of Positive Psychotic Psychic Experiences (CAPE-42) in HC subjects.

All participants, including those with PSD and HC subjects, completed the DACOBS and CBQp, along with the Positive and Negative Syndrome Scale (PANSS), Global Assessment of Functioning Scale (GAF) for patients with PSD and the Community Assessment of Positive Psychotic Psychic Experiences (CAPE-42) for HC subjects.

The study followed the guidelines of the Declaration of Helsinki and was approved by the Çanakkale Onsekiz Mart University Faculty of Medicine Ethics Committee. Informed consent was obtained from all participants, and their sociodemographic data were documented.

Measures

Cognitive biases

Davos Assessment of Cognitive Biases Scale (DACOBS): DACOBS is a 7-point Likert-type (1 = strongly disagree, 7 = strongly agree) scale consisting of 42 items that assess cognitive biases in the last two weeks. This self-report scale includes three higher-order scales (cognitive biases, cognitive limitations, and safety behaviours) and seven subscales, each subscale consisting of six items: four cognitive biases [jumping to conclusion bias (JTC), belief inflexibility bias (BI), attention to threat bias (AT), and external attribution bias (EA)], two cognitive limitations [social cognition problems (SocCog) and subjective cognitive problems (SubCog)], and avoidance behaviours [safety behaviours (SB)]. The overall scores ranged from 42 to 294. Higher

scores are associated with more severe cognitive limitations or biases. The original study found good reliability for DACOBS (Cronbach's alpha = 0.90), and DACOBS could adequately distinguish between patients with PSD and HCs (9). Convergent validity was confirmed for the five subscales but not for the two cognitive limitation subscales.

The Cognitive Biases Questionnaire for Psychosis (CBQp): The CBQp comprises 30 vignettes, half of which are pleasant and the other half unpleasant. These vignettes were adapted from the Cognitive Style Test (CST), which evaluates cognitive distortions in depression on the themes of "anomalous perceptions (AP)" and "threatening events (TE)" (40). The scale assesses five cognitive biases considered important in the pathogenesis of psychosis: jumping to conclusions (JTC), intentionalizing (Int), catastrophizing (Cat), emotional reasoning (ER), and dichotomous thinking (DT). Each theme has three statements for each bias (six statements per bias), and each statement is rated on a 3-point scale ranging from 1 to 3, with 1 indicating no bias, 2 indicating some qualification for bias, and 3 indicating the presence of bias. Scoring ranged from 30 to 90 points in total (15–45 for each theme and 6–18 for each cognitive bias). Cronbach's alpha for the total CBQ was 0.89, indicating good internal consistency. Regarding test-retest reliability, the correlation was 0.94 in the psychosis group, showing good reliability (36).

The Turkish versions of DACOBS and CBQp are presented in Appendix 1 and 2.

Psychotic Symptoms and Psychotic-like Experiences

Positive and Negative Syndrome Scale (PANSS): This scale has been used for the assessment of psychotic symptoms in patients with PSD (41). The Positive Syndrome Scale (30 items in total), the Negative Syndrome Scale (7 items), and the General Psychopathology Scale (16 items). Each item was scored on a scale of 1–7 based on symptom severity. The Turkish version of the scale was psychometrically reliable and valid. For the Turkish version of the PANSS, Cronbach's alpha coefficients for the Positive Syndrome Scale, Negative Syndrome Scale, and General Psychopathology Scale are 0.75, 0.77, and 0.71, respectively (42).

Global Assessment of Functioning Scale (GAF): The GAF has been extensively used to assess psychological, social, and occupational functioning in patients with mental illnesses. In scoring, a rating from one (most impaired) to 100 (least impaired) was made by providing descriptors for each 10-point interval (43).

Community Assessment of Psychic Experiences-42 (CAPE): The CAPE is a reliable, comprehensive, and valid scale developed to assess self-reports of lifetime psychotic experiences and psychotic tendencies in emotional and non-emotional domains (44). The scale includes 42 items covering three sub-dimensions: positive (20 items), negative (14 items), and depression (8 items). CAPE assesses the frequency and degree of distress associated with positive psychic experiences. In this study, we only used the frequency scale. The frequency score is measured on a 4-point scale ranging from "never"=1, "sometimes"=2, "often"=3, to "nearly always"=4. The overall scores on the frequency scale range from 42 to 168, with higher scores indicating higher frequency. In the Turkish version of CAPE, the scale's Cronbach's alpha coefficient was 0.91, and the subscales were between 0.79 and 0.83 (45). CAPE was administered only to the HC group.

Statistical Analyses

Data were analyzed using the IBM Statistical Package for Social Sciences (SPSS) program version 29.0 and JAMOVI version 2.4.12. Statistical significance was set at P <0.05.

The study examined the psychometric properties, including reliability and validity, of the Turkish versions of the DACOBS and CBQp scales:

I) To assess the construct validity, a confirmatory factor analysis (CFA) was performed. Based on the original studies, one, three, and seven-factor models for DACOBS and one, two, and five-factor models for CBQp were tested. The structural equation modeling was done using the JAMOVI software, and a diagonally weighted least-squares estimation method was preferred for polychoric correlations due to the ordinal nature of the data (46). The model fit was evaluated using the comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), standardized root mean residual square (SRMR), and relative chi-square (χ^2/df) (47). Adequate values for CFI and TLI were considered to be 0.90 and above and 0.95 and above for a very good fit. For RMSEA, values of 0.08 and below were considered adequate, and 0.05 and below very good. For SRMR, a cut-off value of 0.08 or below was considered adequate. Values of χ^2/df <3.0 were considered good, and those <2.0 very good (43). The CFA sample size was estimated to be five participants per item (42 items for DACOBS), with a required sample of at least 210 participants (48).

II) Cronbach's alpha and McDonald's ω coefficients were computed to assess the internal consistency of the scales (reliability).

III) A multivariate analysis of covariance (MANCOVA) was performed to evaluate whether the cognitive bias scales could distinguish between patients with PSD and HC subjects, while controlling for factors such as educational level, sex, and age.

IV) The discriminative power of DACOBS and CBQp was assessed using Receiver Operating Characteristics (ROC) analysis and represented by the Area Under the Curve (AUC).

V) Correlations were calculated between the DACOBS and the CBQp to measure construct validity.

VI) Finally, the relationship of DACOBS and CBQp with PANSS and GAF (patients) or CAPE (controls) was analyzed.

RESULTS

Demographic Information for the Samples

One hundred sixty-two participants (48.6%) were female and 171 (51.4%) males. The age and sex of the groups were not significantly different (p>0.05), but there were significant differences in terms of education and employment status (p<0.001). Demographic and clinical variables are presented in Table 1.

Construct Validity of DACOBS and CBQp

Table 2 presents the fit statistics of the one, three (higher-order scales: cognitive biases, cognitive limitations, safety behaviours), and seven (JTC, BI, AT, EA, SocCog, SubCog, and SB) factor models of DACOBS and one, two (AP, TE) and five (Int, Cat, DT, JTC, and ER) factor model of CBQp.

Based on the results for DACOBS, the seven-factor solution demonstrated the best fit for the model. Moreover, one and three-factor solutions showed adequate fit, except for χ^2/df values just above the threshold. Additionally, all items loaded significantly on their hypothesized subscales (p <0.05). For the CBQp, the five-factor solution fits the model well. The one and two-factor solutions showed adequate fit values, except for the SRMR values just above the threshold. Latent factor correlations were also high for the two and five-factor solutions to the CBQp.

Internal Consistency

The Cronbach's alpha coefficients for DACOBS, CBQp, and their subscales were calculated for the total sample (N=333). The DACOBS total score had

Table 1. Characteristics of the participants

Characteristics	Patients (n=171)	Controls (n=162)	p-value
Age (years)	42.06±12.8 Range: 18–78	40.24±14.1 Range: 18–79	0.255
Sex (female)	81 (47.4%)	81 (50%)	0.631
Education (years)	10.0±3.91	12.11±3.71	<0.001
Marital Status (unmarried) [a]	146 (85.4%)	66 (40.7%)	<0.001
Working status (working) [b]	34 (19.9%)	106 (65.4%)	<0.001
Age at disorder onset (years)	26.03±9.94	-	

[a] Unmarried category included single, divorced, and widowed participants. [b] Unworking category included retired or disability retired.

Table 2. Fit indices of CFA for DACOBS and CBQp

Model	χ^2/df	CFI	TLI	RMSEA (95% CI)	SRMR
Threshold for acceptable models	≤3	≥0.90	≥0.90	≤0.08	≤0.08
DACOBS					
One-factor	3.22	0.968	0.966	0.082 (0.078–0.085)	0.076
Three-factor	3.02	0.970	0.968	0.077 (0.074–0.081)	0.073
Seven-factor	2.89	0.972	0.969	0.076 (0.072–0.079)	0.071
CBQp					
One-factor	1.40	0.978	0.976	0.035 (0.028–0.041)	0.081
Two-factor	1.57	0.968	0.966	0.042 (0.035–0.048)	0.085
Five-factor	1.44	0.977	0.974	0.036 (0.029–0.043)	0.080

CBQp: Cognitive biases questionnaire for psychosis; CFI: Comparative fit index; DACOBS: Davos assessment of cognitive biases scale; RMSEA: Root mean square error of approximation; SRMR: Standardized root mean residual square; TLI: Tucker-Lewis index; χ^2/df: Relative chi-square.

Table 3. Reliability results of DACOBS and CBQp

Scales	Cronbach's α	McDonalds' ω	Test-retest r
DACOBS TOTAL	0.94	0.94	0.85
DACOBS CogBias	0.87	0.87	0.79
DACOBS CogLimit	0.88	0.88	0.83
DACOBS SafetyBeh	0.84	0.84	0.75
CBQp TOTAL	0.87	0.87	0.82
CBQp AnomPercept	0.78	0.78	0.74
CBQp ThreatEvent	0.75	0.76	0.82

CBQp: Cognitive biases questionnaire for psychosis; CBQp AnomPercept: Anomalous perceptions subscale of CBQp; CBQp ThreatEvent: Threatening events subscale of CBQp; CBQp TOTAL: Total score of CBQp; DACOBS: Davos assessment of cognitive biases scale; DACOBS CogBias: Cognitive biases scale of DACOBS; DACOBS CogLimit: Cognitive limitations scale of DACOBS; DACOBS SafetyBeh: Safety behaviors (sub) scale of DACOBS; DACOBS TOTAL: Total score of DACOBS.

an excellent Cronbach's alpha coefficient of 0.94. In contrast, the three higher-order scales of DACOBS (Cognitive biases, Cognitive limitations, and Safety behaviours) had good Cronbach's alpha coefficients ranging from 0.87 to 0.88 and 0.84, respectively. Cronbach's alpha coefficients of the seven DACOBS subscales were 0.64 for JTC bias, 0.70 for BI bias, 0.69 for AT bias, 0.78 for EA bias, 0.81 for SocCog, and 0.80 for SubCog.

The CBQp total scale had a good Cronbach's alpha coefficient of 0.87, while the TE and AP scales had acceptable alpha values of 0.75 and 0.78, respectively. The five CBQp subscales also showed acceptable alpha values, ranging from 0.56 to 0.70 (0.70 C, 0.58 I, 0.58 DT, 0.57 EBR, 0.56 JTC). Table 3 demonstrates the reliability of the results.

Test-retest Reliability

A total of 128 participants, comprising 77 individuals diagnosed with PSD and 51 HCs, were administered DACOBS and CBQp at two-time points. The Pearson correlation coefficient between the DACOBS total scores at Times 1 and 2 was 0.850 (p<0.001), indicating good test-retest reliability. The three scales of DACOBS, including cognitive biases, cognitive limitations, and safety behaviors, demonstrated good to moderate test-retest reliability, with correlation coefficients of 0.791 (p<0.001), 0.831 (p<0.001), and 0.745 (p<0.001), respectively.

Similarly, the Pearson correlation coefficient between the total CBQp score at Time 1 and Time 2 was 0.820 (p<0.001), indicating good test-retest reliability. The correlation coefficients for the test-retest reliability were 0.818 (p<0.001) for TE and 0.742 (p<0.001) for AP, indicating good-to-moderate test-retest reliability. Table 3 also shows the test-retest reliability results.

Discriminant Validity

A Bonferroni-corrected MANCOVA was performed with the DACOBS and CBQp scales as dependent variables, groups as an independent variable, and education level, age, and sex as covariates. The MANCOVA

Table 4. DACOBS and CBQp scores of the groups

	Patients		Controls			
Scales	**Mean[a]**	**S. E.**	**Mean[a]**	**S. E.**	**F**	**P[a]**
DACOBS CogBias	101.96	1.48	88.41	1.54	38.89	<0.001
DACOBS CogLimit	50.41	1.03	38.54	1.07	61.65	<0.001
DACOBS SafetyBeh	20.39	0.54	13.27	0.56	79.71	<0.001
DACOBS TOTAL	172.76	2.71	140.22	2.83	66.57	<0.001
CBQp AnomPercept	24.26	0.33	19.99	0.35	76.64	<0.001
CBQp ThreatEvent	24.93	0.32	21.04	0.34	66.52	<0.001
CBQp TOTAL	49.19	0.6	41.04	0.63	84.11	<0.001

[a] Controlled for age, sex, and educational level.
CBQp: Cognitive biases questionnaire for psychosis; CBQp AnomPercept: Anomalous perceptions subscale of CBQp; CBQp ThreatEvent: threatening events subscale of CBQp; CBQp TOTAL: Total score of CBQp; DACOBS: Davos assessment of cognitive biases scale; DACOBS CogBias: Cognitive biases scale of DACOBS; DACOBS CogLimit: Cognitive limitations scale of DACOBS; DACOBS SafetyBeh: safety behaviors (sub) scale of DACOBS; DACOBS TOTAL: Total score of DACOBS; S. E.: Standard error.

Table 5. Correlation of DACOBS and CBQp with PANSS and CAPE (r-values)

	Patients				Controls
Scales	**PANSS Total**	**PANSS Positive**	**PANSS Negative**	**PANSS General**	**CAPE**
DACOBS TOTAL	0.188*	0.185*	0.198*	0.091	0.426**
DACOBS CogBias	0.129	0.150	0.167*	0.034	0.354**
DACOBS CogLimit	0.224**	0.188*	0.191*	0.145	0.471**
DACOBS SafetyBeh	0.180*	0.178*	0.189*	0.100	0.269**
CBQp TOTAL	0.358**	0.286**	0.363**	0.259**	0.491**
CBQp AnomPercept	0.337**	0.275**	0.351**	0.249**	0.431**
CBQp ThreatEvent	0.327**	0.257**	0.324**	0.232**	0.477**

* p<0.05, ** p<0.001.
CBQp: Cognitive biases questionnaire for psychosis; CBQp AnomPercept: Anomalous perceptions subscale of CBQp; CBQp ThreatEvent: Threatening events subscale of CBQp; CBQp TOTAL: Total score of CBQp; DACOBS: Davos assessment of cognitive biases scale; DACOBS CogBias: Cognitive biases scale of DACOBS; DACOBS CogLimit: Cognitive limitations scale of DACOBS; DACOBS SafetyBeh: Safety behaviors (sub) scale of DACOBS; DACOBS TOTAL: Total score of DACOBS; S. E.: Standard error.

results are presented in Table 4. The results revealed a significant main effect of the group (Wilks' λ=0.74, F (5,316)=22.174, p <0.001, partial eta-squared=0.26). Age, sex and educational level were also significantly related to CBQp and DACOBS scales (age: Wilks' λ=0.92, F (5,316)=5.218, p <0.001, partial eta-squared=0.076; educational level: Wilks' λ=0.85, F (5,316)=11.33, p <0.001, partial eta-squared=0.152; sex: Wilks' λ=0.96, F (5,316)=22.174, p=0.025 partial eta-squared=0.04). More specifically, age was negatively related to the TE and AP subscales of the CBQp (p<0.05), and educational level was negatively associated with all (sub) scales of the DACOBS and CBQp (all p <0.001).

Regarding the individual scales, patients with PSD scored significantly higher than the HCs on all DACOBS and CBQp scales and subscales (all p ≤0.001).

The Area Under Curve (AUC) equaled 0.78 for DACOBS total, 0.79 for DACOBS safety behaviours, 0.75 for DACOBS cognitive limitations, 0.73 for DACOBS cognitive biases, 0.79 for CBQp total, 0.78 for CBQp AP, and 0.76 for CBQp TE.

Convergent Validity

All three higher-order DACOBS scales and DACOBS total scores were significantly correlated with two subscales of CBQp and CBQp total scores in the total sample (ranging from 0.539 to 0.667), as well as in the patients' group (ranging from 0.407 to 0.539) and control groups (ranging from 0.484 to 0.597), separately (all p<0.001). Moreover, the JTC subscales of both scales were correlated in all populations and patients (r=0.185, p <0.001 and r=0.160, p <0.05, respectively). The correlation matrices are shown in Appendix 3.

Associations with Psychotic Symptoms and Psychotic-like Experiences

Positive correlations were found between PANSS total score and DACOBS total, CBQp total, Safety behaviours and Cognitive limitations scales of DACOBS, and TE and AP subscales of CBQp scores in the patient group (all p<0.05). Moreover, the PANSS positive scale was significantly correlated with all subscales and total scores of DACOBS and CBQp (all p<0.05), except for the DACOBS Cognitive biases scale (p>0.05). PANSS negative scale was also positively correlated with all scales and total scores of DACOBS and CBQp (all p<0.05). However, PANSS General Psychopathology only correlated with the CBQp scales and CBQp total (p <0.05). Global assessment of functioning score also did not correlate with any scale (all p>0.05).

In the healthy group, all DACOBS and CBQp scales and total scores were highly correlated with the CAPE total scores (all p<0.001). Table 5 presents the correlations among the scales.

DISCUSSION

The present research evaluated the psychometric characteristics of the Turkish versions of the DACOBS and the CBQp versions. For this purpose, the study conducted the following investigations: I) examined the factor structure of the DACOBS and CBQp among a Turkish sample, II) assessed the reliability of both scales and their subscales, III) determined the test-retest reliability of both scales, IV) explored the ability of both scales to differentiate between PSD patients and HCs, V) investigated the convergent validity of the DACOBS and CBQp by calculating their correlation, and VI) used cognitive biases to probe the relationship between psychotic symptoms in PSD patients and positive psychic experiences in HCs. To our knowledge, this is the only available documentation on the psychometric properties of either scale in a Turkish sample.

Regarding the factor structure of DACOBS, the CFA results confirmed the exploratory factor analysis conducted by the original authors (9). Our study found that the seven-factor solutions provided the best fit for the data, similar to that reported by van der Gaag et al. (9). This also aligns with previous results from the Spanish DACOBS (31). In addition, our study observed a good fit for the one and three-factor solutions. Regarding the factor structure of the CBQp, our results suggest that a five-factor solution had a good fit. In addition, adequate fits were observed for the one and three-factor solutions of CBQp. In the original study, the CFA showed that the two and five-factor models did not fit the data when the factors were assumed to be independent (36). Together with the related factors, the 2-factor model provided the best fit to the scale's underlying structure, and the separate theme scores of the CBQp could be meaningfully used in the original study. Our results on the factor structure of the CBQp are among one of the most fitting when compared with the original research and those in other languages (32,36,37).

The reliability (internal consistency) of DACOBS and CBQp was satisfactory. Cronbach's α and McDonalds' ω coefficients for the three higher-order DACOBS scales and two CBQp subscales ranged from 0.75, 0.87, and 0.94 and 0.87, respectively. Regarding the DACOBS and CBQp subscales, our results also showed that we obtained satisfactory indices. However, the JTC bias subscale of both scales showed the worst reliability. Our results are consistent with the results of original studies (9,36). Moreover, the total and scale test-retest reliabilities of the DACOBS and CBQp were satisfactory.

Regarding discriminative power, following the findings of original studies, it was determined that DACOBS and CBQp total scores and their scales were able to differentiate patients with PSD from HCs, after controlling for confounders such as age, sex, and educational level in a Turkish sample. Previous studies reported similar results (32,34,35,37,39). In addition, we considered the AUC values of the DACOBS and CBQp scales to assess their discriminatory power. Each scale and total score revealed an acceptable discrimination (0.70 to 0.79) between patients and healthy controls (49). The safety behaviours scale and CBQp total were the most discriminative scales. Moreover, Gaweda et al. (50) found that safety behaviours are among the best discriminators between low-risk and HC and psychotic patients (similar to the healthy controls in our study). The DACOBS Safety Behaviours (sub) scale is described as a change in behaviour in favour of threatening assumptions, and safety behaviours related to threat anticipation are a central theme concerning psychotic symptoms (51,52). Our results were higher than the AUC values of Spanish and Flemish DACOBS and CBQp studies (32,34).

Regarding convergent validity, significant correlations were detected between the CBQ-P and DACOBS in the entire sample and separately in the patient and healthy control groups. Our results agree with those of Bastiaens et al. (32) and Pugliese et al. (35), and all (sub) scales of the DACOBS and CBQp were significantly associated with self-reported CAPE, demonstrating concurrent validity in healthy controls. Our results revealed moderate correlations between positive psychic experiences and cognitive biases within HCs, which aligns with previous studies (13,34). The present findings show that there is a link between psychic experiences and cognitive biases in a non-clinical sample, in line with Van Os and Reininghaus' s (53) hypothesis that psychosis is not a dichotomous construct and that there is a continuum from normality to clinical diagnosis (the continuum hypothesis of psychosis). In addition, in our study, positive symptoms were related to cognitive limitations, safety behaviours, anomalous perception, and threatening events in patients with PSD. Cognitive biases have been consistently associated with positive psychotic symptoms (5,16,34,54). This result supports the theory that cognitive biases are influential in developing and maintaining positive symptoms (3,6,18,31). Negative symptoms were also associated with the domains of the scales, and general symptoms were linked to anomalous perception and threatening events. Although there is less evidence of the relationship between cognitive biases and negative symptoms, some studies suggest that cognitive biases have the same impact on negative symptoms as they do on developing and maintaining positive symptoms (13). Motivational and behavioural inertia appears to be the patient's perception of limited psychological resources; this perception motivates patients to conserve energy by minimising investment in effortful activities, which may contribute to cognitive bias (55). Moreover, a relationship between cognitive deficits and negative symptoms has been reported (56). However, in the Japanese validation study of the CBQp, no relationship was found between negative symptoms and cognitive bias (39). Further studies are needed to clarify the relationships between cognitive biases and negative symptoms. As the relationship between cognitive biases and psychotic symptoms had a medium to weak effect size in our study, our findings should be interpreted with caution.

The present study had some limitations that must be acknowledged. First, non-psychotic patients were not included in the study as another group, indicating that the DACOBS and CBQp are not validated for the Turkish population with mental disorders other than psychosis. Second, diagnostic tools were not administered to the healthy group. Moreover, it was not assessed whether these individuals were at high or ultra-high risk for psychosis, and probably some of the samples consisted of high-risk individuals. Third, limited data were collected on the sociodemographic and clinical information of patients and healthy individuals, and the effects of this information on cognitive bias were not adequately analyzed. The healthy controls were recruited from the investigators' environment. Fourth, although the impact of education level was controlled for in some analyses, the fact that healthy individuals had higher education levels than patients may have affected the results. Fifth, the retest could not be administered to all participants at an equal time interval. Last, considering that cognitive biases may also have an emotional component, the mood state of the individuals could have been assessed. Lastly, the tasks (e.g., hinting task and beads task) used in the original DACOBS study to validate the scale were not applied in this study.

Although the study has many limitations, it also has some strengths. First, Turkish validation of two functional cognitive bias scales was performed simultaneously and in a large sample of both psychosis patients and healthy controls. Other strengths of the study include a rigorous methodological approach, including tests of internal consistency, test-retest reliability, and concurrent and convergent validity using appropriate comparator tools.

In conclusion, both the DACOBS and the CBQp possess strong psychometric qualities. They can be considered suitable tools for

evaluating cognitive biases among the Turkish population, as supported by original studies for the DACOBS and CBQp. The original seven subscales and three scales of the DACOBS, or the two scales and five subscales of the CBQp, could be utilized for various purposes among the Turkish population.

The availability of practical and easily applicable self-report instruments for cognitive biases is essential, as it allows direct screening and assessment of this crucial domain in both everyday clinical practice and research. The easy identification of cognitive biases in patients with psychosis and in ultra-high-risk individuals is vital for psychoeducation and targeted cognitive interventions. The study represents the first step towards validating cognitive models of psychoses in Turkish individuals. Further research is necessary to investigate the psychometric properties of the Turkish DACOBS and CBQp in a larger, more diverse population, including patients with mental disorders other than PSD.

Acknowledgments: We thank Mark van der Gaag and Emmanuelle R. Peters for their permission and support in translating the DACOBS and CBQp scales into Turkish.

Ethics Committee Approval: Ethics committee approval was received from Çanakkale Onsekiz Mart University Faculty of Medicine Ethics Committee on 22.03.2023 with the approval number of 2023/05–08.

Informed Consent: All participants and their guardians, if any, were informed about the study, and their verbal and written consent was obtained

Peer-review: Externally peer-reviewed.

Author Contributions: Concept- ŞAK, MİA; Design- ŞAK, MİA; Supervision- ŞAK, MİA; Resource- ŞAK, MİA; Materials- ŞAK, MİA; Data Collection and/or Processing- İKA, SS, FEK, ŞAK; Analysis and/or Interpretation- ŞAK, MİA, İKA, SS, FEK; Literature Search- ŞAK; Writing- ŞAK, MİA; Critical Reviews- MİA.

Conflict of Interest: The authors declared that there is no conflict of interest.

Financial Disclosure: This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

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