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Validity and Reliability of the Turkish Form of the Pleasure Expectancies Scale in Patients with Schizophrenia

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ABSTRACT

Objective: Recent studies have shown that anhedonia stems not so much from a reduced capacity to experience pleasure from rewards, but rather from impairments in anticipating future rewards. Therefore, there is a need for instruments that assess pleasure expectancies. The aim of this study was to examine the validity and reliability of the Turkish version of the Pleasure Expectancies Scale (PLEX), developed to evaluate pleasure-related expectancies, in patients diagnosed with schizophrenia.

Methods: This cross-sectional study included clinically stable patients diagnosed with schizophrenia who presented to the Manisa Mental Health and Diseases Hospital. Participants completed the semi-structured Scale for the Assessment of Positive Symptoms (SAPS), the Brief Negative Symptom Scale (BNSS), the Calgary Depression Scale for Schizophrenia (CDSS), and the PLEX self-report scale. Exploratory factor analysis (EFA) was performed using data from 72 randomly selected participants, and confirmatory factor analysis (CFA) was conducted with 150 participants to test the model fit of the obtained factor structure. For discriminant validity, between-group comparisons and correlation analyses were performed. Reliability was assessed using Cronbach's alpha, item–total correlations, and the intraclass correlation coefficient (ICC) for test-retest reliability. Analyses were performed using R 4.4.1.

Results: Data from 222 participants were included in the construct validity, discriminant validity, and reliability analyses (46 women; mean age=43.93±9.87 years). Exploratory factor analysis revealed that a single factor explained 76% of the total variance. Confirmatory factor analysis results indicated good model fit indices (CFI=0.98; TLI=0.97; RMSEA=0.041; SRMR=0, 02). In comparisons across gender, marital status, and employment status, PLEX total scores showed an opposite pattern to BNSS scores. Significant negative correlations were found between the PLEX total score and the BNSS motivation/pleasure subscale (r=-0.91, p <0.001) as well as the BNSS expression subscale (r=-0.46, p <0, 001). Cronbach's alpha for the scale was 0.957, and the ICC was 0.895.

Conclusion: The findings demonstrate that the Turkish version of the PLEX has good validity and reliability in patients diagnosed with schizophrenia.

Keywords: Anhedonia, reliability, schizophrenia, validity

INTRODUCTION

Schizophrenia is a clinically heterogeneous disorder involving positive and negative symptoms as well as various cognitive, emotional, and behavioral impairments (McCutcheon et al. 2020). Although negative symptoms have been considered among the core symptoms since the early years of the disease's definition, positive symptoms have been at the forefront as treatment targets. On the other hand, negative symptoms play a fundamental role in functional impairment and resistance to treatment, and treating these symptoms remains one of the greatest challenges for clinicians (Fusar-Poli et al. 2015). Research on the clinical presentation of negative symptoms has gained momentum, especially in the last 20 years, in

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order to develop appropriate treatment strategies and better understand the neurobiological mechanisms underlying the symptoms (Galderisi 2023).

Research has shown that negative symptoms can be represented under different factors (Galderisi 2023). Although different studies point to various numbers of dimensions, the two-factor model consisting of a total of five subdimensions has been shown to have the strongest structure (Strauss et al. 2019). According to this model, the "diminished expression" factor includes blunted affect and alogia, while the "motivation/pleasure" factor encompasses apathy, social withdrawal, and anhedonia. Although the relevant literature contains conflicting findings, it is thought that each factor has its own neurobiological connections (Galderisi 2023, Galderisi et al. 2018). The mechanisms underlying anhedonia, which is associated with disorders in the reward system, have been relatively better elucidated, and anhedonia is one of the important domains within the Research Domain Criteria (RDoC) scope (Cuthbert and Insel 2013).

In network analysis studies, centrality is a fundamental measure of a symptom's connection strength with other nodes in the symptom network and thus of its high importance in the clinical picture (Epskamp et al. 2012). Recent network analysis studies have shown that anhedonia has the most central role in schizophrenia in terms of psychosocial functioning, cognitive functions, and premorbid adjustment (Chang et al. 2020, Chan et al. 2025). Traditional literature defined anhedonia as a reduction/absolute loss in the capacity to experience pleasure, whereas research conducted over the last twenty years has changed this view. Experimental studies show that the capacity of patients diagnosed with schizophrenia to derive pleasure from immediate rewards (consummatory pleasure) is largely preserved, but that there is impairment in the expectation of pleasure (anticipatory anhedonia) (Gard et al. 2007, Chan et al. 2025). Thus, with studies aimed at understanding the nature of negative symptoms, an important paradigm shift has occurred around the concepts of the emotion paradox or the liking–wanting anhedonia paradox (Chan et al. 2025). Patients fail in the processes of developing mental representations related to the pleasure they experience, using these representations as a source of motivation for the future, and developing an expectation such as "if I do this again, I will enjoy it." This situation shows that it is not the patient's capacity to experience pleasure, but rather their motivation to anticipate and seek pleasure, that is impaired. This demarcation also overlaps with the neurobiological difference between liking and wanting (Gard et al. 2007). This paradox may explain why the pleasure received does not turn into a behavioral output. A prominent and selective impairment in the processes of mentally simulating a future reward, feeling a desire for this reward, and initiating the actions necessary to attain the reward also causes a decrease in patients' social participation (Chan et al. 2025).

Beyond liking and wanting in response to reward, a third component is reward-related learning (Rømer et al. 2015). Learning corresponds to a dynamic process defined as the formation of associations, representations, and foresights regarding future rewards based on past experiences. Learning, which is thought to have a mutual interaction with liking and wanting, is associated with the updating of the instantaneous value according to the difference between the expected result and the actual result (Howes et al. 2024). Neuroimaging studies indicate that anticipatory anhedonia may be associated with a distortion in the activation and maintenance of reward representation (Kring and Barch 2014). Therefore, it is suggested that the distortion in reward learning may contribute to anticipatory anhedonia (Frost and Strauss 2016).

This theoretical framework, based on the relationship between anhedonia and the reward processing process, forms the basis of the cognitive model of negative symptoms (Cuthbert and Insel 2013). According to this model, symptoms such as avolition and anhedonia arise from dysfunctional belief schemas that the individual develops regarding the future and their own performance. Patients diagnosed with schizophrenia develop pessimistic schemas about themselves and the world due to past failure experiences, exclusion, stigmatization, and neurocognitive difficulties (Kart et al. 2021). Rigid, maladaptive cognitive beliefs in the form of "Even if I try, I will not succeed" or "Even if I succeed, I will not enjoy it" break the motivational cycle before it even begins. These cognitive structures push the patient into inaction, inaction reinforces social withdrawal, and social isolation creates a vicious cycle by further deepening negative schemas (Kart et al. 2021).

There are various assessment instruments in the literature developed to evaluate anticipatory anhedonia. The Temporal Experience of Pleasure Scale (TEPS), developed by Gard et al., is an important self-report instrument that examines the consumption and anticipation dimensions of anhedonia separately (Gard et al. 2007, Ince et al. 2024). On the other hand, the fact that the scale items measure the pleasure being experienced regarding future situations instead of pleasure expectancy has caused criticism. For example, items such as "When I think about eating my favorite food, I can almost feel how good it tastes" or "I get so excited the night before a big vacation that I can barely sleep" are related to the experiential pleasure felt while thinking about future events, not to cognitive beliefs and expectations regarding future pleasure. Temporal experience of pleasure scale has been subjected to some criticism because this situation obscures the relationship of the belief system with negative symptoms in schizophrenia (Saperia et al. 2025).

Among the clinical assessment tools that allow for a detailed examination of negative symptoms, the Brief Negative Symptom Scale (BNSS) and the Clinical Assessment Interview for Negative Symptoms (CAINS), while containing items related to anticipatory anhedonia and consummatory anhedonia, do not evaluate these dimensions as separate subscales and provide a single anhedonia score. For this reason, it remains limited for making specific inferences, especially regarding pleasure expectancy (Polat Nazlı et al. 2016, Vayisoğlu et al. 2024). In addition, while the Positive and Negative Syndrome Scale (PANSS) does not treat anhedonia as a separate negative symptom dimension, the Assessment of Negative Symptoms (SANS) does not distinguish between consummatory pleasure and pleasure expectancy (Kay et al. 1987, Andreasen 1989).

Although it is a clinically important concept, there is no scale that directly evaluates cognitive beliefs regarding pleasure expectancy in schizophrenia. Current assessment tools either focus on the pleasure experienced while thinking about future events (e.g., TEPS) or evaluate items related to anticipatory and consummatory pleasure together within a single anhedonia score (e.g., BNSS, CAINS) (Chan et al. 2025). However, the pleasure experienced while thinking about a future reward may be more related to the capacity for instantaneous pleasure than to anticipation (Visser et al. 2020). This situation makes it difficult to distinguish the relationship of cognitive processes regarding pleasure expectancy with negative symptoms. Due to this deficiency, the Pleasure Expectancies Scale (PLEX) was developed by Saperia et al. in 2025 as a short and easy-to-administer self-report scale aiming to directly evaluate generalized expectations for enjoying future events. In this study, it was aimed to evaluate the validity and reliability of the PLEX scale in schizophrenia by adapting it to Turkish. In the study, besides construct validity and reliability analyses, correlation analyses and comparisons between groups according to socio-demographic characteristics were performed to test discriminant validity. In addition, the possible effects of depressive symptom severity and psychotic symptom severity, which may be among the secondary causes of negative symptoms, were also taken into account in the analyses.

METHOD

Participants

Patients who applied to the Manisa Mental Health and Illnesses Hospital Psychiatry Outpatient Clinic and Community Mental Health Center and whose schizophrenia diagnosis was confirmed using the Structured Clinical Interview for DSM-5 (SCID-5) were included in this cross-sectional study. In addition, patients with a diagnosis of schizophrenia (F20) in the electronic health records in the institute's database were reached out by phone and invited to participate in the study. Of the 395 patients reached during the study process, 359 who agreed to participate were examined. Participants considered to meet the inclusion and exclusion criteria determined during the interviews were included in the study. Clinically stable patients between the ages of 18–65, who have at least primary education and are literate, and who provided consent to participate in the study were included. Patients who have been using antipsychotics at an appropriate dose for the last 6 months and who have not required a dose increase within the last 3 months were considered clinically stable (Garcia-Portilla et al. 2020). Being in a period of psychotic flare-up, a history of alcohol/substance use disorder within the last 6 months, substance use within the last 48 hours, degenerative neurological disease, severe vision/hearing disorder, or cognitive impairment at a level that would affect comprehension were determined as exclusion criteria.

Twenty participants were included in the pilot study phase where face validity was evaluated. Data from 222 participants separate from these patients (20.7% female, age=43.4±9.86 years) were included in the validity and internal consistency analyses, and data from 30 participants were included in the test-retest phase (26.6% female, age=44.13±10.42 years) (Fig. 1).

The study was approved by the Başkent University Clinical Trials Ethics Board (Decision no: KA25/288, Date: 03.09.2025). The study was conducted in accordance with the principles of the Declaration of Helsinki, and written informed consent was obtained from each participant.

Study Design and Data Collection Tools

This study uses a cross-sectional design to examine the psychometric properties of the Turkish form of the PLEX scale. Clinically stable patients with schizophrenia were included in the study to control for the episode effect.

Data Collection Tools

The data collection process was carried out in a quiet room suitable for the interview. The administration of semi-structured scales and SCID-5 interviews were conducted by an expert psychologist (Ö. Y.) with at least 5 years of experience in interviewing patients with a diagnosis of schizophrenia and psychometric evaluation.

The Brief Negative Symptom Scale (BNSS) for negative symptoms and the Calgary Depression Scale for Schizophrenia (CDSS) for depressive symptom severity were administered. Additionally, the PLEX self-report scale was given to patients to assess their pleasure expectancy. It was considered important when interpreting the factor structure to check whether the

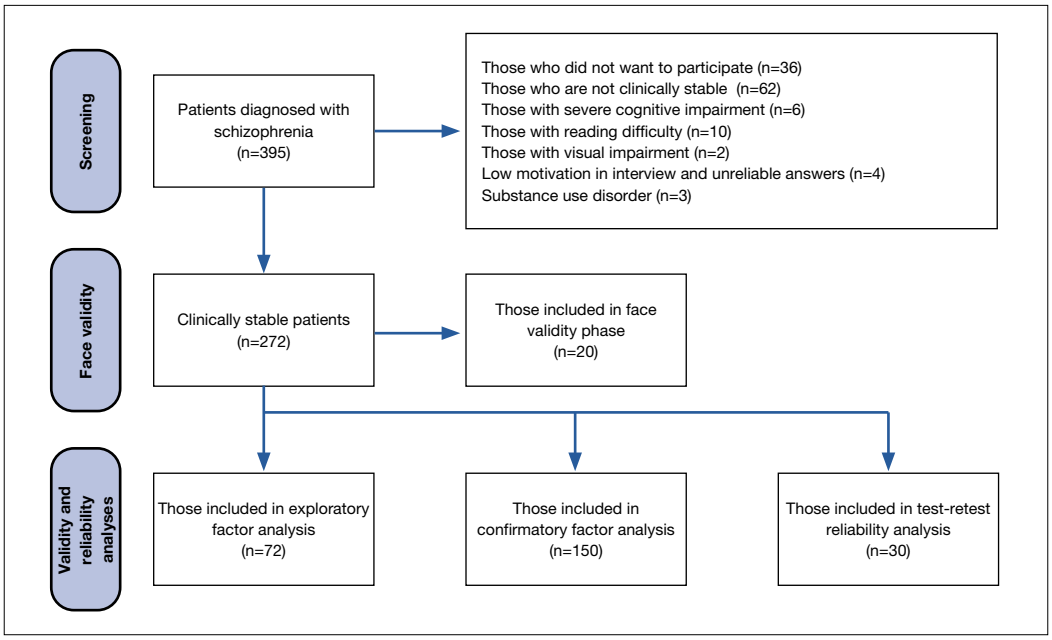

Figure 1. Flow chart of the study.

groups included in the exploratory factor analysis (EFA) and confirmatory factor analyses (CFA) differed in terms of clinical and socio-demographic variables. Analyses performed in groups with similar characteristics may allow for partial control of factors that could be clinically confounding. Therefore, the Scale for the Assessment of Positive Symptoms (SAPS) was administered for psychotic symptoms. Chlorpromazine equivalent doses were calculated based on the daily doses defined by the World Health Organization (Defined Daily Doses, DDD) (Leucht et al. 2016).

Pleasure Expectancies Scale (PLEX)

PLEX, developed by Saperia et al. (2025), is an 8-item self-report scale that measures the expectations of individuals with a diagnosis of schizophrenia regarding their enjoyment of future events (Saperia et al. 2025). The scale items question the individual's expectation that they will generally enjoy life, experience good things, and that future activities will be good for them. The items have a 7-point Likert-type (1=Strongly disagree, 7=Strongly agree) scoring. After reverse coding items 1, 2, 4, and 6, higher scores indicate higher pleasure expectancies. The scale does not have a cutoff score. Cronbach's alpha values evaluated at two separate time points were found to be 0.741 and 0.815. Correlation analyses showed that the scale's discriminant validity was good and that test-retest reliability was confirmed over a six-month period (Saperia et al. 2025).

Scale for the Assessment of Positive Symptoms (SAPS)

Scale for the assessment of positive symptoms (SAPS) is an interview-based tool used to measure the presence and severity of positive symptoms of schizophrenia. It consists of four subscales and a total of 34 items. The evaluation is based on observations from interviews with patients and information obtained from the patients' close entourage. The subscales evaluate hallucinations (seven items), delusions (thirteen items), bizarre behaviors (five items), and formal thought disorder (nine items). While the items in each subscale allow for the assessment of symptoms specific to that domain, the last item of each subscale contains the clinician's general evaluation regarding the relevant symptom cluster. Each item is scored between 0–5 (0=absent; 5=severe). Subscale scores are obtained by the sum of the items in the relevant subscale. The Turkish validity and reliability study of the scale developed by Andreasen was conducted by Erkoç et al. (Andreasen 1984, Erkoç et al. 1991)

Brief Negative Symptom Scale (BNSS)

The semi-structured scale developed for the assessment of negative symptoms consists of six subscales. It consists of a total of 13 items evaluating anhedonia, lack of emotional distress, asociality, avolition, blunted affect, and alogia (Kirkpatrick et al. 2011). While the scores obtained from anhedonia (BNSS-ANH), asociality (BNSS-AS), and avolition (BNSS-AV) items correspond to the motivation/pleasure subscale (BNSS-Mot), the sum of alogia (BNSS-AL) and blunted affect (BNSS-BA) scores reflects the emotional expression (BNSS-EE) subscale. The factor structure of the Turkish version of the scale was found to be the same as the original scale (Polat et al. 2016).

Calgary Depression Scale for Schizophrenia (CDSS)

It is a semi-structured scale developed for the assessment of depressive symptoms in schizophrenia, consisting of nine items scored between 0–3 on a 4-point Likert type (Addington et al. 1996). The Turkish validity and reliability of the scale were conducted by Aydemir et al. (Aydemir et al. 2000).

Procedure

Initially, permission for translation was obtained from the developer of the original scale via e-mail. Subsequently, the scale was translated from English to Turkish by two psychiatrists (C. C. and E. M.). Then, back-translations were performed independently by a psychiatrist and a medical English expert who had not seen the original scale and possessed native-level English competence. The translation and back-translations were compared by three researchers, and a consensus-based final Turkish form was created. For content validity, the Turkish form and the original scale were sent to four medical doctors in psychiatry who are experts in negative symptoms and depression in schizophrenia. After the necessary arrangements were made in line with the received recommendations, the final form was administered to 20 patients to assess face validity, and feedback was obtained regarding the clarity and comprehensibility of the items. At this stage, it was not deemed necessary to make any changes to the items. Subsequently, in accordance with the minimum sample recommendations in the literature for factor analyses, data of 72 participants randomly selected from 222 participants were included in the analyses for EFA, and data of 150 participants for CFA (O'Rourke and Hatcher 2013). In order to assess test-retest reliability, the final form of the scale was administered twice with a 2–4 week interval to 30 separate participants who were not included in the factor analyses.

Statistical Analysis

Statistical analyses were performed using R v4.4.1 (The R Project for Statistical Computing). No missing data was observed in the data set. Prior to the analyses, the scores of PLEX items 1, 2, 4, and 6 were reverse coded as recommended. The normality assumption was assessed with skewness and kurtosis values, and values within the ±1 range were accepted as consistent with normal distribution (George and Mallery 2024). Since SAPS scores and chlorpromazine equivalent doses did not show normal distribution, logarithmic transformation was applied. It was observed that chlorpromazine equivalent doses still violated the normality assumption after logarithmic transformation. To test the similarity of the sociodemographic and clinical profiles of the groups included in the EFA and CFA analyses, continuous variables were compared with t-test or Wilcoxon-Mann-Whitney test, and categorical variables were compared with chi-square test. Since the Wilcoxon-Mann-Whitney statistic (W), which is equivalent to the Mann-Whitney U statistic, was calculated with R software, the W value was reported in the intergroup comparison of variables that did not show normal distribution. In the EFA applied to test construct validity, the parallel analysis method based on the condition that the eigenvalue is greater than 1 was used to determine the appropriate number of factors. The single-factor structure was found to be significant and explained 75% of the total variance. The obtained factor structure was tested with CFA using the lavaan package (Rosseel et al. 2014). Model fit was assessed with chi-square index [chi-square/degree of freedom (χ^2/df)], comparative fit index (CFI), goodness-of-fit index (GFI), Tucker-Lewis index (TLI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA). For discriminant validity analyses, intergroup comparisons of BNSS scores and PLEX total score were made in terms of gender, marital status, and employment status. Although the data had a normal distribution, Welch's t test was used in these comparisons since the variances were not homogeneous. Moreover, Pearson correlation coefficients between PLEX and BNSS and CDSS scores were calculated.

Additional analyses were performed with in order to examine whether current psychotic symptoms affect anhedonia assessments. In this context, patients with all SAPS item scores ≤2 and CDSS score ≤4 were classified as the primary negative symptom (PNS) group, and other patients as the secondary negative symptom (SNS) group (Lambert et al. 2010, Bucci and Galderisi 2017). Scale comparisons between groups were made with Welch's t test since variances were not homogeneous. Furthermore, the relationship slopes between BNSS scores and PLEX total score were compared between groups with linear regression analyses. Thus, it was assessed whether the observed relationship could be explained by secondary causes.

In reliability analyses, Cronbach's Alpha internal consistency coefficient and item-total correlations were calculated. To assess test-retest reliability, the intraclass correlation coefficient (ICC) was calculated using the irr package (Gamer et al. 2012).

RESULTS

Sociodemographic and Clinical Characteristics

The clinical and sociodemographic characteristics of the 222 patients included in the study and the subgroups included in the EFA and CFA analyses are presented in Table 1. In the comparisons made, no significant difference was found between the subgroups in terms of sociodemographic characteristics, chlorpromazine equivalent dose, or clinical scale scores. While no significant correlation was found between the PLEX total score and age (r=-0.08, p=0.789),

Table 1. Socio-demographic and clinical characteristics of the patients

	Total sample (n=222)	EFA Sample (n=72)	CFA Sample (n=150)	t/χ^2	p
Age	43.43 (9.87)	44.86 (9.37)	42.77 (10.05)	t (220)=-1.47	0.144
Gender (F/M)	46/176	20/52	26/124	$\chi^2(1)$=2.62	0.105
Duration of education	8.98 (3.92)	8.69 (3.65)	9.11 (4.04)	t (220)=0.75	0.452
Marital status[a]					
Married	48 (21.6)	15 (20.8)	33 (22)	$\chi^2(1)$=0.01	0.981
Unmarried/Divorced	174 (78.4)	57 (79.2)	117 (78)		
Employment status[a]					
Employed	52 (22.7)	12 (14.3)	40 (26.7)	$\chi^2(1)$=2.183	0.14
Unemployed	170 (77.3)	60 (85.8)	110 (73.3)		
CPZ equivalent dose	700(0–2502)	677.5(0–2502)	758.55(0–2469.9)	W=4278	0.339
Age of disease onset	26.58 (8.18)	27.53 (7.84)	26.13 (8.32)	t (220)=-1.18	0.240
BNSS total	22.10 (14.26)	21.77 (14.35)	22.25 (14.26)	t (220)=0.23	0.816
BNSS-ANH	6.50 (5.11)	6.00 (5.14)	6.74 (5.09)	t (220)=1	0.318
BNSS-AV	3.21 (2.98)	3.06 (3.00)	3.28 (2.97)	t (220)=0.52	0.606
BNSS-AS	3.60 (2.70)	3.74 (2.81)	3.53 (2.65)	t (220)=-0.54	0.592
BNSS-AL	3.25 (2.78)	3.23 (2.47)	3.27 (2.92)	t (220)=0.09	0.925
BNSS-BA	5.53 (3.60)	5.74 (3.81)	5.43 (3.51)	t (220)=-0.59	0.554
BNSS-Mot	13.31 (9.99)	12.80 (10.22)	13.55 (9.90)	t (220)=0.52	0.603
BNSS-EE	8.79 (5.87)	8.97 (5.85)	8.70 (5.89)	t (220)=-0.32	0.750
SAPS total	8.36 (13.11)	8.67 (14.74)	8.22 (12.33)	t (220)=0.29	0.772
SAPS-D	2.65 (4.69)	2.96 (5.25)	2.50 (4.42)	t (220)=-0.12	0.906
SAPS-H	2.10 (4.88)	2.76 (5.45)	1.79 (4.58)	t (220)=-1.59	0.113
SAPS-FTD	3.01 (6.14)	2.16 (5.79)	3.41 (6.28)	t (220)=1.82	0.069
SAPS-BB	0.61 (2.06)	0.80 (2.58)	0.52 (1.77)	t (220)=-0.68	0.500
CDSS	2.35 (3.66)	2.93 (4.31)	2.09 (3.28)	t (220)=-1.6	0.112
PLEX total	39.33 (13.90)	40.86 (14.39)	38.61 (13.66)	t (220)=-1.12	0.266

EFA: exploratory factor analysis; CFA: confirmatory factor analysis; F/M: female/male; CPZ: chlorpromazine; BNSS: brief negative symptom scale; BNSS-ANH: BNSS anhedonia score; BNSS-AV: BNSS avolition score; BNSS-AS: BNSS asociality score; BNSS-AL: BNSS alogia score; BNSS-BA: BNSS blunted affect score; BNSS-Mot: BNSS motivation/pleasure subscale; BNSS-EE: BNSS emotional expression subscale; SAPS: scale for the assessment of positive symptoms; SAPS-D: SAPS delusion subscale; SAPS-H: SAPS hallucination subscale; SAPS-FTD: SAPS formal thought disorder subscale; SAPS-BB: SAPS bizarre behavior subscale; CDSS: Calgary depression scale for schizophrenia; PLEX: pleasure expectancies scale. Marital status and work status are reported as n (%), CPZ equivalent dose as median (min-max), and other variables as mean (standard deviation).
χ^2: chi-square test statistic, t: t statistic, W: Mann-Whitney-Wilcoxon statistics.

age of disease onset (r=0.103, p=0.127), and chlorpromazine equivalent dose (r=-0.027, p=0.687), a weak positive correlation was detected between duration of education and PLEX (r=0.245, p<0.001).

Construct Validity

The construct validity of the scale was first analyzed with EFA, and the number of factors to be extracted was determined by parallel analysis. To assess the suitability of the data for factor analysis, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was calculated as 0.904, and the Bartlett test of sphericity was found to be significant (χ^2=673.4, df=28, p<0.001). These results indicate that the relationship between items is strong and corroborate that the data set is suitable for EFA. Parallel analysis showed that the single-factor solution was sufficient (Fig. 2). The factor loadings of the items range

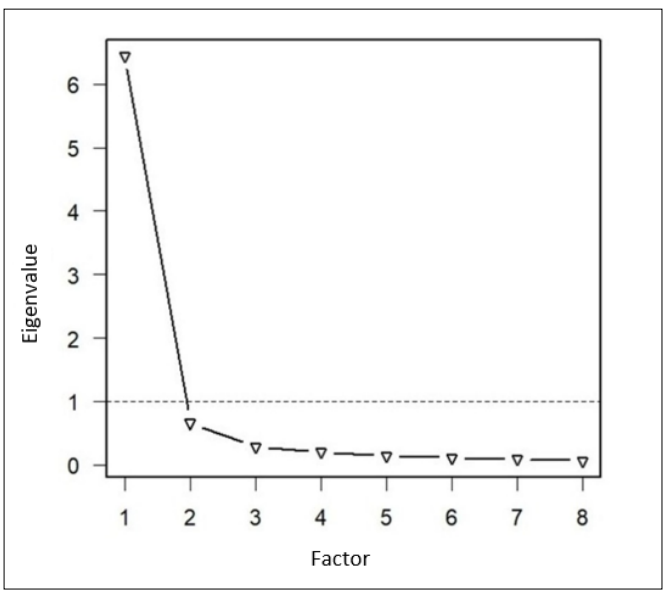

Figure 2. Post-EFA Slope Pool Graph

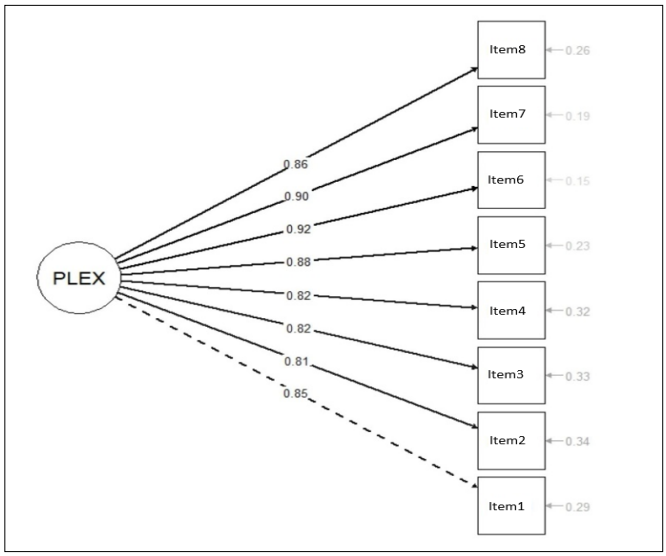

Figure 3. Standardized Regression Coefficients of PLEX Items

between 0.798 and 0.927, and the single factor explains 76% of the total variance.

The model fit of the single-factor structure tested with CFA was found to be good [$\chi^2(20)=24.97$, $\chi^2/df=1.25$, $p=0.203$]. The incremental fit indices, CFI, GFI, and TLI were found to be 0.98, 0.95, and 0.97, respectively. These values indicate a good level of fit (Goretzko et al. 2024). Similarly, an RMSEA of 0.041 (<0.05) and an SRMR of 0.02 (<0.08) indicate a good model fit to the observed data (Browne and Cudeck 1992, Chen et al. 2008). The standardized regression coefficients obtained from CFA are shown in Fig. 3.

Discriminant validity

To test discriminant validity, comparisons were made between groups in terms of gender, marital status, and employment status for BNSS scores, and CDSS and PLEX total scores, which are theoretically expected to be associated with anhedonia (Table Appendix 1). In the analyses performed, no significant difference was found between men and women in terms of alogia and CDSS; and between employed and non-employed individuals in terms of CDSS and anhedonia. In terms of marital status, no difference was observed between groups for any scale score. On the other hand, while the PLEX total score was found to be higher in employed individuals and women, all BNSS scores (except for anhedonia in terms of employment status and alogia in terms of gender) were found to be higher in non-employed individuals and men. The fact that PLEX and BNSS scores show an opposite pattern in intergroup comparisons supports the discriminant validity of the scale.

In other analyses performed to assess discriminant validity, moderate-strong negative correlations were found between the PLEX total score and BNSS total and subscale scores (r=-0.46 to -0.93, all p<0.001). The highest correlations were observed with the anhedonia subscale (r=-0.93, p<0.001) and the motivation/pleasure subscale (r=-0.91, p<0.001). Additionally, a moderate negative correlation was found between the CDSS total score and the PLEX total score (r=-0.64, p<0.001). Correlations between all scale scores are presented in Table Appendix 2.

In the comparisons made between PNS and SNS groups, BNSS total score, anhedonia, avolition, and asociality scores, and the motivation/pleasure subscale score were found to be significantly higher in the SNS group (Table Appendix 3). While the SAPS total and all subscale scores and the CDSS score were found to be higher in the SNS group, the PLEX total score was found to be higher in the PNS group. In regression models including the interaction of negative symptom scores and PLEX score, the PLEX score predicted all negative symptoms in a negative direction, while the main effect of the group was not found to be significant in any model (Table Appendix 4). Furthermore, it was shown that the interaction of PLEX score and group did not significantly predict any negative symptom score.

Reliability Analyses

In the reliability analysis of the single-factor model, the Cronbach's alpha value was found to be 0.957, indicating excellent internal consistency. The corrected item-total correlations (CITC) of the scale items range between 0.796 and 0.9 (Table 2).

In the test-retest reliability analysis, the ICC calculated using a two-way model that takes into account the variation between both participants and time points was found to be 0.895 (95% CI: 0.793–0.949). This value indicates that the scale has excellent test-retest reliability. The obtained coefficient is statistically significantly different from the null distribution [$F(29,30)=17.9$, $p<0.001$].

Table 2. Reliability analysis results

	CITC	CAID
1. When it comes to experiencing pleasure in life, my expectations are generally low	0.826	0.952
2. I often feel like there's no point in trying new things because I know I won't enjoy doing them	0.796	0.953
3. I go into most activities anticipating to find some level of enjoyment	0.808	0.953
4. Most activities that other people seem to enjoy probably won't be all that pleasurable for me	0.9	0.947
5. I can think of many fun activities in my life that I'm looking forward to	0.798	0.953
6. Almost nothing seems enjoyable to me anymore	0.852	0.95
7. I'm pretty confident in my ability to find pleasure in most things that I do	0.875	0.948
8. I can think of multiple hobbies that I know I would enjoy	0.836	0.951

CITC: corrected item-total correlation; CAID: Cronbach's Alpha value if item deleted.

DISCUSSION

Experimental studies indicate that impairment in the anticipatory dimension of anhedonia is more prominent in schizophrenia. On the other hand, in a meta-analysis study examining scale study findings, it was found that there was no significant difference between anticipatory pleasure and consummatory pleasure in patients diagnosed with schizophrenia, and that patients had similar anhedonia scores to healthy individuals (Visser et al. 2020). It is thought that one of the main reasons for the contradiction between studies is that the TEPS, which is widely used to assess anticipatory pleasure as a separate dimension, measures the tendency to experience pleasure towards future events rather than the expectation of pleasure (Visser et al. 2020, Saperia et al. 2025). Pleasure expectancies scale was developed to fill this gap in the literature. This study has demonstrated that the Turkish form of PLEX is valid and reliable in assessing beliefs regarding pleasure expectancy in patients diagnosed with schizophrenia. At the same time, it was determined that pleasure expectancy was lower in men and non-employed patients, and that there was a positive correlation between duration of education and pleasure anticipation.

The parallel analysis performed to evaluate the factor structure of the scale suggested a single-factor solution. It was found with EFA that the single factor explains 76% of the total variance. It is recommended that the explained variance in sole-factor patterns be more than 40% (Tavşancıl 2010). At the same time, the factor loadings of the items were found to be between 0.798 and 0.927. These values are prominently higher compared to those from the original scale development study (0.254–0.794) (Saperia et al. 2025). The study by Saperia et al. (2025) included patients receiving treatment both in outpatient care and through inpatient admission to a psychiatry service. The participants' difficulty in concentrating during disease episode periods may disrupt the stability of responses, reducing inter-item correlations. In our study, only clinically stable patients were included. The differences in factor loadings between studies may be due to changes in the process of understanding and responding secondary to the disease period.

The CFA conducted to confirm the sole-factor model resulted in $\chi^2/df=1.25$, CFI 0.98, TLI 0.97, RMSEA 0.041, and SRMR=0.02. Fit indices indicate that the model shows a good level of fit (Tavşancıl 2010, Goretzko et al. 2024). The standardized regression coefficients ranged between 0.81 and 0.91. Therefore, all items strongly represent the factor. In the original scale study, however, CFA was not performed. Our findings demonstrate that the Turkish form of the scale is valid in terms of construct validity.

In the analyses conducted for discriminant validity, an adverse pattern was observed between the PLEX total score and most negative symptom scores. When evaluated in terms of gender, all negative symptoms other than alogia and the subscale scores were higher in men, whereas the PLEX total score was higher in women. In line with our findings, it has been shown that the severity of negative symptoms is consistently higher in men and in unemployed patients (Amoretti et al. 2025, Moniem and Kafetzopoulos 2025). In a meta-analysis examining studies using the TEPS, both consummatory anhedonia and anticipatory anhedonia were found to be higher in men (Visser et al. 2020). However, there are criticisms that the TEPS assesses the pleasure an individual is currently experiencing in relation to future rewards, rather than the pleasure expectancy, which plays a central role in the cognitive model of negative symptoms (Visser et al. 2020, Saperia et al. 2025). In the only study conducted from this perspective and using the PLEX developed to assess pleasure expectancy, no differences were found between groups in terms of gender, marital status, and employment status (Saperia et al. 2025). Another finding of our study is the same-direction association between duration of education and pleasure expectancy. This relationship may be associated with many factors not assessed in our study, such as cognitive reserve, socio-cultural factors, treatment adherence, and stigma-coping strategies. Future studies to reveal the relationships between socio-demographic characteristics and pleasure expectancy may be guiding in elucidating the relationships between negative symptoms and preventable psycho-social factors such as stigma, exclusion, and loneliness (Mısır and Cengisiz 2024). Indeed, a decrease in pleasure expectancy may, apart from anhedonia, cause asociality and avolition by way of avoiding situations that could be considered social rewards. An increase in negative symptoms may also accelerate the decline in functionality by causing depressive symptoms, feelings of alienation, and self-marginalization. Indeed, in our study, significant negative correlations were found between pleasure expectancy and all negative symptom scores and the severity of depressive symptoms. The strongest relationships with pleasure expectancy were found between anhedonia and the BNSS motivation/pleasure subscale. These findings support the scale's discriminant validity.

The very high correlation between the PLEX total score and BNSS-ANH may suggest that the two measurement instruments assess similar structures. On the other hand, the PLEX items interrogate pleasure expectancy and do not contain items related to consummatory pleasure. The BNSS-ANH subscale reflects the shared variance of items related to anticipatory and consummatory anhedonia. In other words, the very high relationship between the two scale scores may be due to the structure of BNSS-ANH. However, in our study, anticipatory and consummatory pleasure were not directly compared. Therefore, although the findings support that PLEX assesses anticipatory pleasure, it is not possible to

reach the conclusion that it makes the distinction between anticipatory and consummatory pleasure.

Although neuroimaging studies show that both anhedonia dimensions have different neural activity patterns, the results of scale studies indicate that the separation is not at a significant level (Barch et al. 2014, Zhang et al. 2016, Giordano et al. 2018). This may be because, as noted earlier, widely used scales actually take into account momentary pleasure regarding the future reward while assessing pleasure expectancy. Therefore, it was concluded that there is a need to use PLEX, which is considered to specifically assess pleasure expectancy, together with tools that address consummatory anhedonia as a separate dimension in task-based future studies in order to provide a parallel measurement of the neurobiological differentiation underlying negative symptoms.

In schizophrenia, negative symptoms may be intrinsic to the disease itself (primary negative symptoms), but they may also emerge due to different causes such as depression, psychotic symptoms, and extrapyramidal symptoms (secondary negative symptoms). To our knowledge, it has not yet been clearly demonstrated whether the relationship pattern of pleasure expectancy with primary and secondary negative symptoms differs. In our study, in intergroup comparisons based on the levels of secondary causes, the severity of anhedonia, avolition, and asociality symptoms constituting the motivation/pleasure dimension was shown to be higher in the SNS group. Similarly, pleasure expectancy was also found to be lower in the SNS group. The fact that the PLEX score shows a pattern similar to the motivation/pleasure dimension between groups supports the scale's discriminant validity. However, in regression models that included the interaction of negative symptom scores and PLEX score, it was observed that the relationship between PLEX score and negative symptom scores did not differ across groups. These findings indicate that the relationship between PLEX and anhedonia, avolition, and asociality may be independent of the source of the negative symptoms. However, these results do not make it possible to draw clear inferences regarding the relationship of pleasure expectancy with secondary factors.

The negative relationship we found in our study between pleasure expectancy and anhedonia, avolition, and asociality may be mediated by reward-related learning. It is thought that impairment in learning reward value and probability may cause a decrease in pleasure expectancy (Frost and Strauss 2016). Low pleasure expectancy may also adversely affect learning reward value (Martin et al. 2020). Mutual interaction in reward processing processes may lead to anhedonia, asociality, and avolition through avoidance of situations that can be considered social reward (Rømer et al. 2015). At the same time, psychotic and depressive symptoms may be determinant in the relationship between reward processing processes and negative symptoms by causing attributional bias toward reward salience and impairment in the level of motivation (Kim et al. 2018). Pleasure expectancies scale may contribute to the literature by investigating, in studies that control for secondary factors, the possible mechanistic processes underlying the causal role of reduced expectancy of pleasure in the emergence of other negative symptoms.

Reliability analyses revealed that the Turkish form of the scale has high internal consistency (Cronbach α=0.957). In the study conducted by Saperia et al. (2025), the internal consistency coefficient of the scale was found to be 0.768 and 0.821 at baseline and at 6 months, respectively. The higher internal consistency shown in our study may be related, as mentioned earlier, to our sample consisting of stable patients. The ICC value was found to be 0.895, indicating a high level of test-retest reliability. In the study conducted by Saperia et al. (2025), the correlation between assessments made 6 months apart was found to be 0.58. Although the relationship between measurements at the two time points in the study was significant ($p<0.001$), over a long period such as 6 months the patients' levels of pleasure expectancy are at risk of changing depending on many factors. Shorter periods such as 2–4 weeks are recommended for test-retest reliability analyses (Tavşancıl 2010).

The fact that its items are not based on culture-specific behavioral contexts can be seen as a strength of the scale. It was considered that not including items referring to specific social activities, forms of entertainment, or life style patterns and focusing on pleasure expectancy related to the general human experience would limit the scale's measurement bias that may arise from culture-specific life style differences.

This study has some limitations. First, the sample consists only of clinically stable patients. Although the sample choice ensures control of factors that may be related to the episode in testing the psychometric characteristics of the scale, this may limit the generalizability of the results to patients in the acute psychotic period. Second, it may be thought that the high proportion of male patients in the sample could limit the generalizability of our findings to female patients. However, in comparisons between genders, the pattern of difference between scale scores supports discriminant validity. At the same time, no literature information was found regarding the role of gender in the effectiveness of reliability analyses. Third, the single-center nature of the study limits the generalizability of the results to the entire population. Fourth, the back-translation texts were not evaluated by the original developers of the scale. This may be considered a limitation in that possible differences in meaning in the translation process cannot be completely ruled out. Fifth, psychotic and depressive symptom severity was taken as the basis for defining the SNS group. Although not included in all studies in the literature in which the SNS definition was used, the fact that extrapyramidal symptoms were not evaluated limits

attributing the symptom pattern observed in the SNS group entirely to secondary negative symptoms.

In conclusion, the Turkish form of PLEX was shown to be a valid and reliable scale for assessing pleasure expectancy in patients diagnosed with schizophrenia. Given the central role of pleasure expectancy in the development of negative symptoms, there is a need for future studies in which the relationship of pleasure expectancy with clinical presentation and neural correlates is investigated. It was considered that PLEX would contribute to the literature as a useful and reliable measurement instrument in the measurement of pleasure expectancy. In future studies, it is recommended that the predictive power of pleasure expectancy on functional outcome be examined longitudinally. Studies using PLEX may also enable a more comprehensive testing of the emotion paradox hypothesis in schizophrenia. At the same time, findings obtained from studies may provide critical information in terms of identifying preventive interventions. In addition, demonstrating the validity and reliability of PLEX in different illnesses such as major depressive disorder and schizoaffective disorder, and then investigating the differences between illnesses in terms of the neural correlates of pleasure expectancy through neuroimaging studies may help elucidate the mechanisms underlying anhedonia. Moreover, investigating the relationship between the effect of cognitive behavioral therapy on negative symptoms in schizophrenia and the change in pleasure expectancy may be guiding for the steps in the therapy process.

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SUPPLEMENTARY

https://www.turkpsikiyatri.com/upload/u27884_EN_appendix.pdf

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