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# Validity and reliability of Turkish version of the craving experience questionnaire in the assessment of cigarette smoking

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## ABSTRACT

**Background:** Intense desire (craving) for smoking is an essential feature of a tobacco use disorder. The aim of this study was to cross-culturally translate and validate the Turkish version of Craving Experience Questionnaire (CEQ-T).

**Methods:** Forward-backward-forward translation method was used to translate. The methodological study sample included 744 current daily tobacco smokers. The validity of the scale was tested with construct (through exploratory factor analysis) validity and criterion-related validity. The Fagerström Test for Nicotine Addiction (FTND) and Substance Craving Scale (SCS) were used for criterion-related validity. Cronbach's alpha, Pearson product-moment correlation coefficient and independent samples t-test were used to evaluate the reliability of the scale by internal consistency and test-retest method.

**Results:** The construct validity showed three factors in each form that explain 77.4% of total variance for CEQ-T-Strength and, 78.4% for CEQ-T-Frequency. There was a significant positive correlation between CEQ-T and FTND and SCS. Cronbach's alpha internal consistency coefficient was 0.87 for CEQ-T-Strength, and 0.83 for CEQ-T-Frequency. In test-retest reliability, the correlation coefficient was 0.88 for CEQ-T-Strength and 0.89 for CEQ-T-Frequency.

**Conclusion:** The Turkish version of CEQ is a valid and reliable measuring tool that can be used to assess the craving in Turkish smokers.

## ARTICLE HISTORY

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## KEYWORDS

Craving; smoker; validity; reliability; Turkish

## Introduction

Smoking is the leading cause of death, illness, impoverishment and one of the most important public health threats facing the world. Eight million deaths worldwide each year are directly related to tobacco use (World Health Organization, 2020). Although statistics to combat smoking are promising, quitting smoking is not easy to achieve. There are many factors that force smokers to quit smoking. Withdrawal symptoms, weight gain, fear of failure, lack of support, depression and enjoyment of tobacco are common roadblocks to quitting smoking (Akçay et al., 2013).

In individuals with substance use, the strong desire to use the substance, the severity of which can vary from person to person, is defined as "craving". The "craving" included in the criteria for substance use disorder in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (American Psychiatric Association, 2013), is an essential feature of tobacco use disorder, as well as an important indicator of relapse (Potvin et al., 2015). Craving for smoking also complicates the compliance with treatment. This desire persists and continues to influence smokers for a long time. In people with severe smoking urges, it is reported that it is useful to apply different methods of treatment and prepare the treatment plan accordingly (Killen & Fortmann, 1997; Potvin et al., 2015).

In order to assess smoking addiction, there are many scales in Turkey (Sağlam, 2017; Uysal et al., 2004) and around the world (DiFranza et al., 2002; Etter et al., 2003; Fagerström, 1978;

Heatherton et al., 1991; Kawakami et al., 1999; Lairson et al., 1992; Piper et al., 2004; Sağlam, 2017; Shiffman et al., 2000).

However, there are a limited number of scales associated with craving for cigarettes in the world (Shiffman et al., 2000; Tiffany & Drobes, 1991; West & Hajek, 2004). No studies on a scale measuring craving have been encountered in Turkish literature. Valid and reliable measurement tools are needed to evaluate the cravings of smokers.

The aim of this study was to cross-culturally translate the English version of the Craving Experience Questionnaire (CEQ) to the Turkish language (CEQ-T) and to assess the questionnaire's reliability and validity in order to measure the intense desire to smoke in Turkish smokers.

## Materials and methods

### Study design and participants

The study was planned using a methodological design. When calculating the required sample size for scale development or adaptation studies, it is recommended to collect data from 5 to 10 people per item (Karakoç & Dönmez, 2014). Therefore, for the validity and reliability study of the CEQ consisting of 20 items, at least 200 participants, which is 10 times the number of items, are planned to be included in the sample scope. In addition, in studies of scale validation in the literature, the sample sizes of  $n = 50$ ,  $n = 100$ ,  $n = 200$ ,  $n = 500$ , and

$n = 1000$  have been perfectly defined as “very weak,” “weak,” “mediocre,” “good,” and “very good,” respectively (Şencan, 2005). The aim of this study was to reach a sample size of more than 10 times the number of items and exceed  $n = 500$ .

The convenience sampling method was used in the research. A total of 744 participants, including 286 women and 458 men who were 18 years of age and older (current daily smokers), who consulted the three Family Health Centers located in Izmir for any reason between July 2017 and August 2017 were recruited. Alcoholics (the state of alcohol consumption of the individuals was questioned by the type and amount of alcohol consumed weekly. Individuals who exceeded the count of 14 units per week were excluded from the study) and/or persons with drug/substance use were excluded from the study.

## **Instruments**

### **Data collection form**

It was a data form developed by the researchers with questions that revealed the sociodemographic characteristics of the participants, age, gender, etc., and their smoking status.

### **Fagerström test for nicotine dependence (FTND)**

Fagerström (1978) proposed the Fagerström Tolerance Test to assess nicotine addiction. The FTND, which is also widely used in cigarette quitting outpatient clinics, is a revised version of the Fagerström Tolerance Test (Heatherton et al., 1991). Turkish validity and reliability of the test was conducted by Uysal et al. (2004) (Cronbach’s alpha: 0.56). The test consists of six questions and each question is scored according to the answer. It is possible to obtain anywhere between 0 (the least) and 30 points in this test. According to the total score, nicotine addiction is rated in five groups in the form of very low dependence (0–2 points), low dependence (3–4 points), moderate dependence (5 points), high dependence (6–7 points), and very high dependence (8–10 points).

### **Substance craving scale (SCS)**

It is an adaptation of the Penn Alcohol Craving Scale (Flannery et al., 1999) developed to evaluate other than alcohol drug dependence. This scale was adapted to Turkish by Evren et al. (2011) (Cronbach’s alpha: 0.84). The Likert scale consists of five items and each item is evaluated between 0 and 6 points. The total score that can be obtained from the scale is 0–30.

### **Craving experience questionnaire (CEQ)**

CEQ was developed in 2013 by May et al. (2014). This scale originated from the “Elaborated Intrusion” theory proposed by Kavanagh et al. (2005). The theory argues that craving is a cognitive-emotional phenomenon initiated by thoughts triggered by the mind, body, or environment.

CEQ is adapted from the Alcohol Craving Experience (ACE) scale, which measures the intensity and compulsion of the desire for alcohol (Statham et al., 2011). When making the adjustment, the data from 12 studies were used, which included ACE variations arranged for cigarettes, food, and chocolate. The purpose of this adaptation was to test whether the scale has the same factorial

structure, regardless of the acclaimed substance and time-table (May et al., 2014).

The scale consists of two forms: “strength” and “frequency,” each containing 10 items. Both strength and frequency forms contain three subscales: intensity, imagery, and intrusiveness. Scoring of items is carried out with a visual analog scale of 0–10 (May et al., 2014).

The expressions on scales need to be answered at a certain time. Different time frames were used in terms of what time the items on the scales would be answered. In the study group where smokers were included, time frames such as “now,” “last week,” “last time,” and “last 5 min” were used. In this study, we evaluated “last week” for the “strength” form and “last time” time frames for the “frequency” form (May et al., 2014).

In the adaptation of the ACE to CEQ, the Cronbach’s alpha value of the strength form was 0.91, whereas that of the frequency form was 0.94 (May et al., 2014).

## **Procedures**

To begin with, Jon May, who developed the scale for CEQ’s adaptation to Turkish, was contacted via e-mail and the necessary permission to adapt the scale was obtained. Translating the English form into Turkish was carried out in three stages. In the first stage, five researchers in the field of smoking addiction who had proficiency in English translated the scale from English to Turkish independently of each other. Later, these five researchers came together to compare the translations and included the items thought to best express the equivalence of the scale in terms of language in the translation measurement tool. In the second stage, a translator who was bilingual in both languages translated the final version of the scale into English, which was the source language. During these translations from English to Turkish, and back again from Turkish to English, it was confirmed that there was no meaning change or loss. In the third stage, the Turkish scale was presented to the opinion of three field experts to determine whether or not the items in the scale that were translated were equivalent to original scale. The recommendations of the experts on the form of expression and content of items were evaluated and the necessary changes were made. It was decided to use the final version of the scale that appeared after expert reviews.

After the translation process was finished, in order to assess the clarity of the regulated final version of the scale, a pilot application was carried out in 10 participants with characteristics similar to those to be measured, but not included in the research sample, and feedback was obtained from them. As a result of the received feedback, the necessary changes were made and the scale was finalized.

The response was obtained using a face-to-face survey. Each application took approximately 10 min. Three weeks after the first application, by face-to-face interview or by phone, 150 participants were provided to refill the CEQ-T.

## **Data analysis**

Data were analyzed using the Statistical Package for Social Sciences (SPSS) version 24.0 (IBM, Armonk, NY, USA).

Sociodemographic data were analyzed using frequencies, means, and ranges as appropriate.

In this study, the validity of the scale was tested by construct and criterion-related validity. Explanatory factor analysis (EFA) was applied to examine the construct validity. The compatibility of the data set with EFA was evaluated by the Kaiser-Meyer-Olkin (KMO) coefficient and the Bartlett's test. For factor analysis, the results of the KMO test must be 0.50 and above and those of the Bartlett's test result must be statistically significant ( $p < .05$ ) (Karagöz & Kösterelioğlu, 2008; Yurdabakan & Çüm, 2017). Principal component analysis and varimax rotation technique were used to determine the structure of the factor that constitutes the scale. The number of factors was determined using the "Kaiser Criteria" method, which suggests that eigenvalue should be continued with factors greater than 1, and the "scree plot" method, which offers a slope graph of eigenvalues (Yurdabakan & Çüm, 2017). In the graph, "scree plot" refers to a factor between two points. The descriptive factor analysis in the literature emphasizes that the limit value is 0.40 for the load values in the factor in which the items are involved (Şencan, 2005; Tay & Jebb, 2017). In our study, it was accepted that the minimum factor charge value of a substance should be 0.40.

Concurrent validity was used to test criterion-related validity. When applying the concurrent validity, Pearson product-moment correlation coefficient was calculated to study the relationship between CEQ-T and SCS and FTND.

In our study, reliability, internal consistency, and test-retest methods were evaluated. Cronbach's alpha for internal consistency, Pearson product-moment correlation coefficient, and t-test in dependent groups were used for test-retest reliability. A  $p$  value of  $<0.05$  was considered statistically significant.

In the original scale study, the analysis was conducted separately for two forms of the scale with a factor of three. In our study, analyses were divided into both forms to compare with the original scale when measuring two different states (strength and frequency) and adapting the scale using different time frames, which were applied separately.

## Results

### Sample characteristics

The age of the participants was between 18 and 80 years and the mean age was  $41.66 \pm 13.99$  years. The overall sociodemographic characteristics of participants are illustrated in Table 1.

Participants' cigarette use had the following features: the average number of cigarettes smoked per day was  $20.55 \pm 12.30$  (min: 1, max: 80), and average smoking time of  $25.62 \pm 25.51$  (min: .03, max: 231) was detected as pack/year.

The evaluation of the test-retest reliability was conducted in a subsample of these participants ( $n = 150$ ) 3 weeks after the first assessment (females = 40.7%; age means = 39.45, SD = 12.70).

### Validity analysis

The construct validity of the CEQ-T was examined by EFA. For EFA compliance of the data set, the KMO value of the

**Table 1.** Socio-demographic characteristics of the participants ( $n = 744$ ).

Socio-demographic characteristics	n	%
Gender		
Female	286	38.4
Male	458	61.6
Age group		
18–24	98	13.2
25–35	171	23.0
36–45	185	24.9
46–60	218	29.3
> 60	72	9.7
Marital status		
Married	474	63.7
Single/divorced/separated/widowed	270	36.3
Educational level		
No formal education	16	2.2
Primary-secondary	246	33.1
High school	236	31.7
Above high school	246	33.1
Employment status		
Working	412	55.4
Non-working	332	44.6

CEQ-T-Strength form was calculated as 0.85, and the KMO value of the CEQ-T-Frequency form was 0.80. The Bartlett' test was determined for CEQ-T-Strength ( $\chi^2 = 4617.529$ ,  $p < .0001$ ) and for CEQ-T-Frequency ( $\chi^2 = 4690.909$ ,  $p < .0001$ ). As a result of the analysis, the data set was in accordance with the EFA. In validity analysis, the original structure of the scale was preserved. In the CEQ-T-Strength form, the items were loaded into three factors explaining 77.4% of the total variance. The intensity, imagery, and intrusiveness subscales were 17.6%, 48.5%, and 11.1%, respectively, of the total variance of the CEQ-T-Strength. On examining the scree plot chart, the number of factors according to the bend point of the slope was determined as three (Figure 1). Factor loadings were found to be between 0.83 and 0.85 for the intensity subscale, between 0.54 and 0.90 for the imagery subscale, and between 0.78 and 0.87 for the intrusiveness subscale. In the CEQ-T-Frequency form, the items were uploaded to three factors explaining 78.4% of the total variance. The intensity, imagery, and intrusiveness subscales were 21.0%, 41.7%, and 15.6%, respectively, of the total variance of the CEQ-T-Frequency. On examining the scree plot chart, the number of factors according to the bend point of the slope was determined as three (Figure 2). Factor loadings were found to be between 0.88 and 0.89 for the intensity subscale, between 0.58 and 0.91 for the imagery subscale, and between 0.76 and 0.93 for the intrusiveness subscale (Table 2).

As a result of Pearson correlation analysis to assess the criterion-related validity of the scale, there was a positive and statistically significant correlation between CEQ-T and FTND ( $r = .20$ – $.39$ , low relationship) and SCS ( $r = .40$ – $.59$ , moderate relationship) scores, which were received as criteria ( $p < .05$ , Table 3).

### Reliability analysis

The total Cronbach's alpha coefficient of the scale was calculated as 0.92. The Cronbach's alpha coefficients of the two forms of CEQ-T were determined as 0.87 in the CEQ-

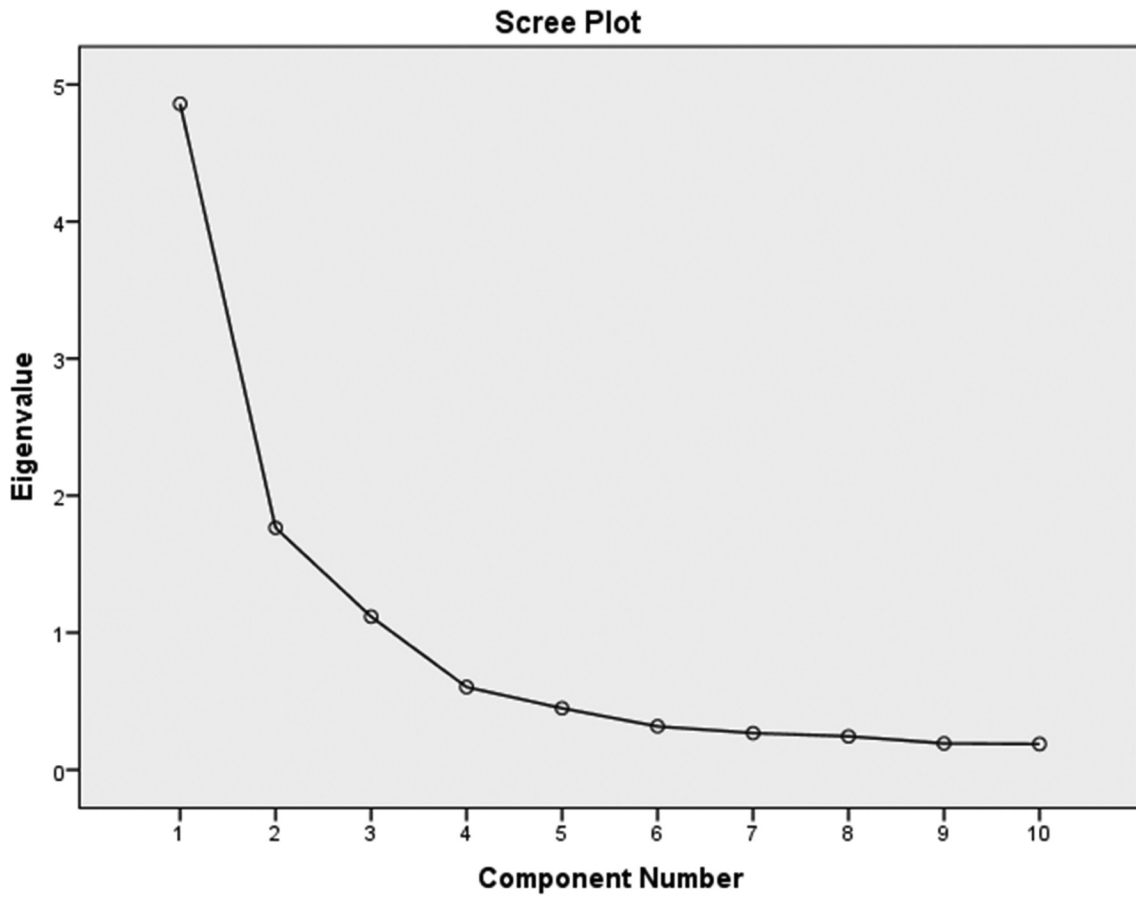


Figure 1. Scree Plot test for CEQ-Turkish Strength form based on the principal component analysis (n = 744).

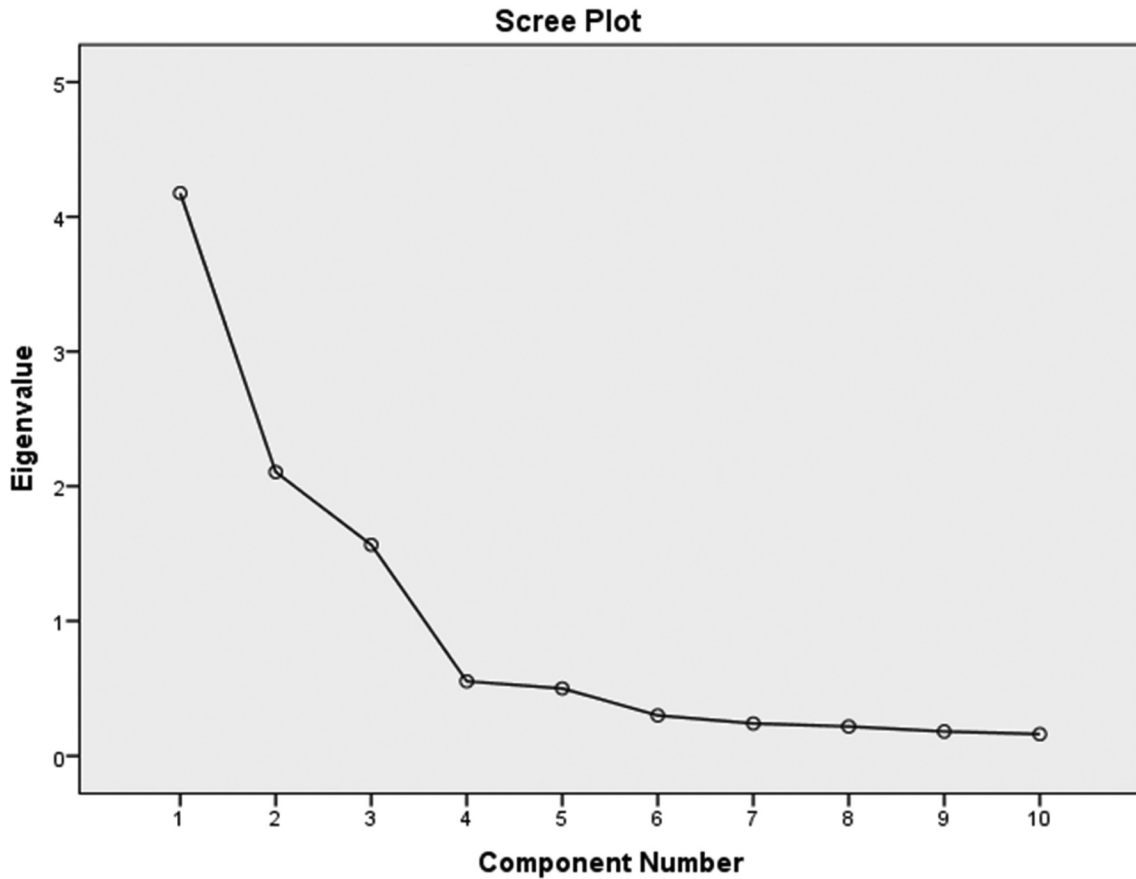


Figure 2. Scree Plot test for CEQ-Turkish frequency form based on the principal component analysis (n = 744).

**Table 2.** Factor loadings for the three extracted factor after varimax rotation for CEQ-T-S and CEQ-T-F.

	CEQ-T-S factor loading			CEQ-T-F factor loading		
	Intensity	Imagery	Intrusiveness	Intensity	Imagery	Intrusiveness
R1	0.841			0.880		
R2	0.853			0.881		
R3	0.832			0.891		
R4		0.547			0.586	
R5		0.896			0.908	
R6		0.905			0.912	
R7		0.879			0.895	
R8			0.875			0.882
R9			0.869			0.931
R10			0.780			0.768
Explained variance (%)	17.6	48.5	11.1	21.0	41.7	15.6
Total explained variance (%)	77.4			78.4		
Eigen value	1.765	4.859	1.117	2.105	4.176	1.565

CEQ-T-S: Craving Experience Questionnaire-Turkish Strength form

CEQ-T-F: Craving Experience Questionnaire-Turkish Frequency form

**Table 3.** Correlation between CEQ-T scores and FTND scores and SCS scores (n = 744).

Scale	CEQ-T-Strength form		CEQ-T-Frequency form	
	r	p	r	p
FTND	0.393	< 0.0001	0.311	< 0.0001
SCS	0.474	< 0.0001	0.404	< 0.0001

Statistical significance is highlighted as bold fonts.

CEQ-T: Craving Experience Questionnaire-Turkish

FTND: Fagerstrom Test for Nicotine Dependence

SCS: Substance Craving Scale

T-Strength form and 0.83 in the CEQ-T-Frequency form. The Cronbach's alpha coefficients of all three subscales of the CEQ-T-Strength form were 0.86. The Cronbach's alpha coefficients of the lower dimensions of the CEQ-T-Frequency form ranged from 0.83 to 0.88. **Table 4** presents CEQ-T corrected item-total correlation and Cronbach's  $\alpha$ .

A sample group consisting of 150 participants was used for the test-retest application of the CEQ-T, which was conducted at an interval of 3 weeks. It was found that the two forms of the scale evaluated by the Pearson moment multiplication correlation had a positive relationship between test-retest scores (for CEQ-T-Strength  $r = 0.889$ ,  $p < .0001$ ; for CEQ-T-Frequency  $r = 0.891$ ,  $p < .0001$ ; **Table 5**). No statistically significant difference was found between the mean scores of the CEQ-T-Strength form in the first and second administrations

**Table 4.** CEQ-T corrected item-total correlation and Cronbach's  $\alpha$  (n = 744).

Items	CEQ-T-Strength form		CEQ-T-Frequency form	
	Corrected item-total correlation	Cronbach's $\alpha$ if item deleted	Corrected item-total correlation	Cronbach's $\alpha$ if item deleted
R1	0.62	0.86	0.52	0.82
R2	0.55	0.87	0.49	0.82
R3	0.64	0.86	0.53	0.82
R4	0.57	0.87	0.59	0.81
R5	0.64	0.86	0.68	0.80
R6	0.59	0.86	0.63	0.80
R7	0.58	0.86	0.63	0.81
R8	0.60	0.86	0.33	0.83
R9	0.66	0.86	0.40	0.83
R10	0.59	0.86	0.45	0.82

CEQ-T: Craving Experience Questionnaire-Turkish

( $p > .05$ , **Table 5**). A statistically significant difference was found between the CEQ-T-Frequency form mean scores ( $p < .05$ , **Table 5**).

Based on the correlation between the first and second application of each item, the test-retest reliability coefficients of the items were between  $r = 0.71-0.93$  ( $p < .05$ , **Table 6**).

## Discussion

In this study, the English version of CEQ developed by May et al. was adapted to Turkish in order to measure cigarette craving. The results show that the Turkish version of CEQ is an appropriate measuring instrument for Turkish smokers.

## Validity

In our study, EFA was used to determine the construct validity of the scale. Before the factor analysis, KMO test was used to determine whether the sample number was suitable for factor analysis and Bartlett's test was applied to test if the variables correlated with each other. KMO is unacceptable if the value found in the test is below 0.50, wherein 0.50 is weak, 0.60 is medium, 0.70 is good, 0.80 is very good, and 0.90 is perfect. Bartlett's test results must also be statistically significant (rejection of  $H_0$  hypothesis) (Karagöz & Kösterelioğlu, 2008). In our study, the KMO values and Bartlett's test indicate that the sample size of 744 is sufficient and that variables can be factorized, meaning that the data are suitable for factor analysis.

In our study, the "Kaiser Criteria" and "scree plot" method were used in parallel to determine the number of factors; similar to the original (May et al., 2014), the three-factor structure was preserved for both forms of the scale.

After determining the number of factors of the scale, varimax rotation technique was used to explain the structure of the factor that constitutes the scale. The purpose of the rotation was to clarify which item would correspond with which factor (Yurdabakan & Çüm, 2017). The factor loading value is a coefficient that explains the relationship of items with factors (Büyüköztürk, 2002). In the EFA, the limit value is 0.40 for the factor loadings. Items with a factor loading value below 0.40 must be excluded from the analysis (Şencan, 2005; Tay & Jebb,

**Table 5.** Comparison of CEQ-T's forms test–retest score means and correlations (n = 150).

CEQ-T forms	First administration M ± SD	Second administration M ± SD	t*	p	r	p
CEQ-T-S	46.98 ± 25.12	48.42 ± 22.62	1.532	0.128	0.889	< 0.0001
CEQ-T-F	41.90 ± 23.47	45.82 ± 22.49	4.461	< 0.0001	0.891	< 0.0001

Statistical significance is highlighted as bold fonts.

\*t-Test in dependent groups

CEQ-T: Craving Experience Questionnaire-Turkish

CEQ-T-S: Craving Experience Questionnaire-Turkish Strength form

CEQ-T-F: Craving Experience Questionnaire-Turkish Frequency form

**Table 6.** Item test–retest correlations (n = 150).

Items	CEQ-T-Strength form		CEQ-T-Frequency form	
	r	p	r	p
R1	0.818	< 0.0001	0.867	< 0.0001
R2	0.877	< 0.0001	0.877	< 0.0001
R3	0.852	< 0.0001	0.857	< 0.0001
R4	0.867	< 0.0001	0.888	< 0.0001
R5	0.879	< 0.0001	0.905	< 0.0001
R6	0.876	< 0.0001	0.894	< 0.0001
R7	0.921	< 0.0001	0.928	< 0.0001
R8	0.877	< 0.0001	0.710	< 0.0001
R9	0.895	< 0.0001	0.793	< 0.0001
R10	0.877	< 0.0001	0.783	< 0.0001

Statistical significance is highlighted as bold fonts.

CEQ-T: Craving Experience Questionnaire-Turkish

2017). However, in our study, there were no items whose factor loading value was below 0.40. Therefore, no item was removed from the scale.

The strength of the factor structure of the scale can be understood by the proportions of variance obtained. The higher the ratio of variance obtained, the stronger the factor structure of the scale. It is acceptable that the total variance described in behavioral sciences is approximately 50%–60% (Yurdabakan & Çüm, 2017). In the original study of May et al. (2014), the total variance was not explained, but the total variance described in the CEQ-T-Strength and CEQ-T-Frequency forms appears to be sufficient in our study.

In the concurrent validity, the correlation is studied by evaluating the scores that participants received from the scale, which was intended to be developed, are measured by both another test that measures the same behavior and a test that measures another related behavior. It is preferable that the measurements of the two tests to be compared are performed at the same time or in short intervals (Karakoç & Dönmez, 2014). In our study, CEQ-T scores were also positively correlated with nicotine dependence level and non-alcohol craving (Şencan, 2005). In particular, there is a stronger correlation with SCS, which measures the same behavior (craving).

The data obtained show that the Turkish adaptation of the scale has sufficient construct and criterion-related validity in accordance with the original structure.

### Reliability

In this study, internal consistency and test-retesting were used to determine the reliability of the scale. The internal consistency is that the scale items measure the same structure in

relation to each other. In the study, the internal consistency of the CEQ-T was evaluated using Cronbach's alpha. If there is a strong correlation between the items, the Cronbach's alpha value increases. The coefficient should be as close to 1 as possible. In general, the minimum acceptable value for Cronbach's alpha is 0.70 (Karakoç & Dönmez, 2014; Şencan, 2005). In contrast, a Cronbach's alpha value of >0.9 is considered excellent, that between 0.8 and 0.9 is considered good, that between 0.7 and 0.8 is considered acceptable, that between 0.6 and 0.7 is considered suspicious, that between 0.5 and 0.6 is considered weak and below 0.5 is considered unacceptable (Şencan, 2005). In our study, the total Cronbach's alpha coefficient of the scale was 0.92. The original Cronbach's alpha value was 0.91 for CEQ-Strength and 0.94 for CEQ-Frequency (May et al., 2014), and in our study, it was 0.87 for CEQ-T-Strength and 0.83 for CEQ-T-Frequency. The Cronbach's alpha coefficients of the subscales belonging to the CEQ-T-Strength form ranged from 0.86, whereas the Cronbach's alpha coefficients of the subscales of the CEQ-T-Frequency form ranged from 0.83 to 0.86. The Cronbach alpha coefficients, calculated for the total and subscales of both forms, indicate that they have a sufficient level of reliability.

The item-total correlation was calculated in order to evaluate the contribution of the items that make up the scale to the total score and thus determine how much the scale is associated with the totality of the scale. The items whose values are 0.30 and above are considered sufficient in the interpretation of the item-total correlation (Şencan, 2005). The low correlation coefficient calculated for an item indicates that the item is insufficient in measuring the desired condition. The corrected item-total correlation of the original scale was 0.43–0.75 for CEQ-Strength and 0.57–0.84 for CEQ-Frequency (May et al., 2014). On our scale, these values were determined between 0.55 and 0.66 for CEQ-T-Strength and 0.33 and 0.68 for CEQ-T-Frequency. The lowest item-total correlation is the “need” item for CEQ-T-Strength, whereas the “not think” item is similar to the original scale for CEQ-T-Frequency. In the study, it was seen that the correlation coefficients of all the items of the CEQ-T had values above 0.30.

The stability of a scale is evident by similar measurement results at different times. Stability is determined by the test–retest reliability. The test is applied to people of the same or similar characteristics in two different time zones. The test–retest correlation coefficient must be at least 0.80 (Şencan, 2005). Test–retest analysis results of this study could not be compared to the original study (May et al., 2014) because the original study did not include test–retest analysis. However, the test and retest reliability coefficients in the study were determined to be above

0.80, and the statistically positive result between test–retest scores and a meaningful relationship suggests that the scale produces stable results in measurements at different times.

Between the two applications, there was no significant difference between the total score averages in the CEQ-T-Strength form of individuals. In the CEQ-T-Frequency form, a significant increase in the total score average was found in the second application. Over time, although there was no significant difference in the strength of the people’s craving, the frequency of the craving increased significantly. In both forms, the correlation between the first and second application scores of each item indicates that the test and retest reliability coefficients are statistically significant.

Given the reliability analysis, it can be said that CEQ-T is a reliable questionnaire that measures cigarette craving.

### Limitations

Participants of the study consist only of smokers. In future research, the cravings of individuals with addiction to other substances can be evaluated. Other smokers of tobacco and tobacco products containing nicotine were not included in this study. Participants are individuals who are described as “current daily smokers” (World Health Organization Centers for Disease Control, 2011). The percentage of daily smokers in Turkey is 23.8%, whereas the occasional smokers are 3.3% (Public Health Institution of Turkey, 2014). It has been shown that the cravings of occasional smokers can be associated with different structures than daily smokers (Mathew et al., 2015). Therefore, by including only the group of “current daily smokers” in the study, although the study restricts the generalizability of the study to all tobacco smokers, the opportunity to better identify a homogeneous group has been given. Although the study does not have an upper limit restriction in terms of the age of the participants, persons under the age of 18 were not included in the study. In the process of smoking cessation, the validity of these results is controversial in the high-risk group under the age of 18, where instantaneous urination fluctuations cause cigarette leaks (Treloar et al., 2020). The fact that all of the evaluation tools used in the study are based on self-reporting and cross-sectional design can be considered among the limitations.

One of the strengths of the research is that sufficient sample size has been reached. Evaluation of the cravings in the smoking cessation treatment is a field that has not yet been widely studied in Turkey. In our country where tobacco use is high, the fact that this study can measure both the strength and frequency of the cravings is also one of the strengths.

### Conclusion

The results show that CEQ-T is a valid and reliable measuring tool which can be used by health workers to assess the cravings in Turkish smokers. In the scope of smoking cessation treatment, the measurement of the cravings by

applying this scale may increase the treatment compliance and success in the person. The need to study validity and reliability in different sample groups such as “those who quit smoking” in order to expand the availability of scale is an idea that can be given to other researchers for further research.

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### Disclosure of potential conflicts of interest

The authors report no conflicts of interest.

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