Psychometric properties of the Turkish version: the challenges to stopping smoking (CSS-21) scale

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ABSTRACT

Objective: The aim of the study was to evaluate the psychometric properties of the Turkish version of the Challenges to Stopping Smoking Scale-21 (CSS-21).

Methods: The methodological study was conducted with 235 participants who meet the inclusion criteria. "Social-demographics Questionnaire", "Challenges to Stopping Smoking Scale", "Fagerström Test for Nicotine Dependence", and "General Self-Efficacy Scale" were used for data collection. In the validity-reliability analysis of the scale, language and content validity, explanatory and confirmatory factor analysis, concurrent validity, Cronbach's Alpha coefficient, item-total score correlation, split-half reliability analysis, floor and ceiling effects, and test-retest reliability methods were used.

Results: Using exploratory factor analysis, it was found that the CSS-21 has two factors. Its two-factor structure was confirmed using confirmatory factor analysis. The Cronbach's alpha values of subscales were 0.84 and 0.83, respectively. In addition, item subscale total correlations and test-retest analysis of the scale had a high correlation.

Conclusions: It was concluded that the Turkish version of the CSS-21 is a reliable and valid instrument to identify the factors affecting quitting smoking.

Introduction

Smoking is a significant risk factor for diseases such as some types of cancer, respiratory and cardiovascular diseases, and the major cause of mortality among smokers in the world. Evidence suggests that smoking causes more than 8 million deaths a year around the world (World Health Organization, 2019).

Tobacco production and consumption rates are quite high also in Turkey. Having more than 16 million smokers, the prevalence of smoking is 44.1% in males, and 19.2% in females. Yet, smoking prevalence rates have declined worldwide thanks to the raised awareness on the effects of smoking, anti-smoking campaigns, and the effectiveness of pharmacological and psychosocial treatments to quit smoking (West, 2017). Although the smoking prevalence in Turkey dropped by 11.2% since 2000, it has not achieved the desired levels (Erguder et al., 2015). Recognizing the influential behaviors in the onset of smoking or smoking cessation, and identifying the obstacles and problems in relation to smoking cessation will be instructive for a success in the fight against smoking.

Theories help researchers to understand the factors that affect behaviors. In particular, the Social Cognitive Theory (SCT) provides a framework to explain how individuals start and quit smoking behavior, by emphasizing the role of interactions between internal and external stimuli. According to the theory, several factors, such as environmental factors, personal factors, and behavioral factors, act as potential stimulants to promote behavior (Bandura, 2004; Riley et al., 2016).

Environmental factors include any factor external to the individual that can affect his/her behavior. These factors include social and physical factors, such as observational learning, social norms, barriers and facilitators (Schiavo et al., 2019). Personal factors, which are specific cognitive processes and personal tendencies that increase or decrease the probability of an individual's engagement in a particular behavior, include the individual's level of knowledge, attitudes, personal values, self-efficacy, and beliefs. Behavioral factors, however, include existent behavioral repertoire, and behavioral intents, coping skills, or abilities (Riley et al., 2016).

Many studies have also shown that numerous factors may be effective in smokers' decision to quit smoking (Alboksmaty et al., 2019; Georgiadou et al., 2015; Zou et al., 2019). Twyman et al. conducted a systematic review involving 65 studies, investigating the perceived barriers to smoking cessation among vulnerable smokers. Available evidence suggests that there are multilevel factors that pose a barrier to smoking cessation. These factors include individual and lifestyle-related factors (e.g., withdrawal symptoms, nicotine addiction), social and community networks (e.g., acceptability in the community, availability of cigarettes, lack of social support), living conditions (e.g., boredom, stressful factors, and access to resources to quit smoking), and cultural and socioeconomic factors (Twyman et al., 2014). In summary, theoretical and empirical evidence provides an approach for understanding and identifying the factors that contribute to failure to quit smoking. Accordingly, to increase the number of successful

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smoking cessation attempts, it is of importance to consider the potential challenges that cause continue to smoke.

Within the theoretical framework of the SCT, the Challenges to Stopping Smoking (CSS-21) scale was designed to assess environmental and personal factors affecting smoking cessation (Thomas et al., 2016). There is no valid and reliable tool to identify the factors affecting quitting smoking in Turkey. This study aims to test the validity and reliability of the Turkish version of the CSS-21, developed by Thomas et al (Thomas et al., 2016).

Materials and methods

Design

The study used a methodological design.

Participants

The study sample consists of individuals who participated an online questionnaire via social media websites (e.g., Facebook, Instagram, WhatsApp). The inclusion criteria for participating in this study were as follows: self-reported daily or occasional smokers, having a minimum level of literacy, aged 18 years or older, who agreed to participate in the study voluntarily.

In the adaptation of a scale to a different culture, the recommended sample size is 5–10 people for every item on the questionnaire (Tavşancıl, 2019). For the validity and reliability study of the CSS-21 consisting of 21 items, the sample size was calculated as 210 people by taking 10 people per item. Two hundred and thirty-five people who met the study criteria were included in the sample.

Instruments

Social-demographics questionnaire

The Social-demographics Questionnaire was developed by the researcher in the light of literature (Öztürk & Uluşahin, 2015). It consists of 10 questions to collect information about the participants' sociodemographic features and smoking behaviors.

Challenges to stopping smoking scale (CSS-21)

CSS-21 was developed by Thomas et al. in 2016 to determine the challenges or problems associated with stopping smoking. It has a total of two subscales and assesses items as follows: nine items related to the personal aspect of quitting (e.g., "Feeling lost without cigarettes") and 12 items related to social or environmental aspects of quitting (e.g., " Fear of failing to stop smoking"). The first subscale is labeled as "intrinsic factors" (items 1–9) and the second subscale as "extrinsic factors" (items 10–21). It consists of 21-items scored on a 4-point Likert-type scale. Participant's responses to each item vary from 1 (not a challenge) to 4 (major challenge).

In scoring the scale each subscale is assessed separately. The total scale score is not calculated. The average score of a subscale is obtained by summing up the scores the individual gets from each item in that subscale. The scores of the "intrinsic scale" range from 9–36 and the "extrinsic scale" from 12–43. A higher score indicates greater challenges. The original

Cronbach's alpha values of CSS-21 subscales were 0.86 to 0.82, respectively (Thomas et al., 2016).

Fagerström Test for Nicotine Dependence (FTND)

FTND was developed by Heatherton et al. in 1991 and its adaptation into Turkish was made by Uysal et al. in 2004. The scale was designed to assess the intensity of physical addiction to nicotine. It contains six items that evaluate an individual smoker's nicotine dependence. Based on the Turkish validity and reliability study, the internal consistency of the scale was 0.56 (Uysal et al., 2004). In this study, the Cronbach's alpha coefficient was calculated as 0.584.

General Self-Efficacy Scale (GSES)

GSES was developed by Sherer et al. in 1982 and its adaptation into Turkish was made by Yıldırım and İlhan in 2010. It consists of 17-items scored on a 5-point Likert-type scale. Total scale score ranges from 17–85 and higher scores indicate a higher level of belief in one's self-efficacy. Based on the Turkish validity and reliability study, the internal consistency of the scale was 0.80 (Yildirim & Ilhan, 2010). In this study, the Cronbach's alpha coefficient was calculated as 0.724.

Procedures

Language validity

The scale was translated into Turkish by two different bilingual language experts. Next, the researcher formed a bilingual team, including two Turkish language experts, two English language experts, and two field experts, unlike the previous language experts. The scale was reviewed by the language and field experts. The translated version was reviewed and converted into a single form by the researcher. Then, this form was translated back into English by new bilingual language experts. The original and back-translated versions were compared and checked for compatibility by the researcher (DeVellis, 2016; Johnson & Christensen, 2019; Seçer, 2015). A final version was formed.

Content validity

The final Turkish version and the original English version were both submitted to an expert group that included eight academics working in health-related fields. Each expert was asked to evaluate each item for clarity, relevance, and simplicity, using a 4- point Likert-type scale (1 = not appropriate at all, 4 = completely appropriate). The item-level content validity index (I-CVI) was calculated as the number of experts giving a rating of either 3 or 4, dividing by the total number of experts. The scale-level content validity index (S-CVI) was calculated as the average of the I-CVIs for all items on the scale. If the S-CVI and I-CVI were more than 80, it was commented as indicative of high content validity (Alpar, 2018; Yeşilyurt & Çapraz, 2018).

Pilot study

A pilot study is recommended to test the comprehensibility of the scale on the target population before claiming that a new scale is ready to collect data (World Health Organization, 2016). Accordingly, a pilot test was conducted with 35 individuals. None of the results from the pilot test were included in the study.

Data analysis

Data were analyzed using SPSS 23.0 for Windows (SPSS Inc., Chicago, IL, USA) and LISREL 8.8 (Scientific Software Inretational, Inc., Lincolnwood, IL, USA).

Construct validity was analyzed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA was performed using the principal component analysis (PCA) with varimax rotation. Kaiser-Meyer-Olkin (KMO) coefficient and Bartlett's Sphericity test were used for testing the possibility of performing factor analysis. Factor loadings of more than 0.30 were considered satisfactory (Grove et al., 2012; Seçer, 2015). In the CFA, the acceptability of the model was analyzed using certain fit indexes including the chi-squared test (x^2), the root means a square error of approximation [RMSEA], the normed fit index [NFI], the incremental fit index [IFI], the non-normed fit index [NNFI], the goodness of fit index [GFI], the comparative fit index [CFI], the relative fit index [RFI], and the standardized root means square residual [SRMR].

Cronbach alpha, split-half method, item-total correlation, floor and ceiling effects were used for reliability analysis. The minimum acceptable Cronbach's alpha, Spearman-Brown and Guttman split half values should be 0.70 (Karagöz, 2016). The correlation between item-total score was examined by Pearson correlations analysis. The stability of scale was evaluated using the t-test and Pearson's correlation analysis. The Hotelling's T^2 test was used to check whether the item means were different from each other. The significance level was 0.05.

Ethical considerations

Ethics approval was obtained from the Ethics Committee of the Faculty of Medicine at Pamukkale University in accordance with the Declaration of Helsinki (60116787–020/37896). Before commencing data collection, the ethical principle of "informed consent" was followed by explaining the purpose and duration of the research to participants. The principle of "autonomy" was fulfilled by recruiting participants on a voluntary basis, and the principle of "privacy and protection of privacy" was met by assuring participants that and information obtained would be kept confidential.

Results

Sample characteristics

The demographic characteristics of the participants are shown in Table 1.

Content validity

The I-CVI of the scale was found to be between 0.85 and 1.0, and the S-CVI was 0.97.

Pilot study

The internal consistency analysis of the CSS-21 was found to vary between 0.86 and 0.85. The item-total correlations of the scale ranged from 0.248 to 0.744. Since all items were easily understood by the participants, no items were removed from the scale.

Table 1. Sample characteristics (n = 235).

Variables	n	%
Sex		
Female	95	40.4
Male	140	59.6
Education		
Elementary	17	7.2
High school	55	23.4
University	163	69.4
Income		
Insufficient	30	12.8
Middle	152	64.7
Sufficient	53	22.6
Marital status		
Single	155	66
Married	80	34
Job		
Student	97	41.3
Officer	49	20.9
Worker	36	15.3
Self-employement	40	17
House-wife	13	5.5
Family History		
Yes	169	71.9
No	66	28.1
Quitting Attempt		
Yes	178	75.7
No	57	24.3
	Mean±SD	Min.- Max.
Age (years)	29.12 ± 9.82	18–67
Age Smoking Started (years)	18.05 ± 4.22	9–40
Fagerström Test for Nicotine Dependence	4.87 ± 2.68	0–10

Construct validity

As a result of EFA, the KMO value was 0.877, x^2 = 1865.094, df = 210, and Barlett's sphericity test value was found to be $p < .000$. Items were loaded on two factors explaining 42.4% of the total variance and eigenvalues greater than 1.00. The explained variance was 30.4% for the first factor and 11.9% for the second factor in the CSS-21. The factor values were found to vary between 0.316 and 0.812 for the first factor and 0.399 and 0.792 for the second factor (Table 2).

CFA results clearly indicated that two-factor model was a good fit for the data (x^2 = 450.48, df = 186, p = .000, x^2/df = 2.42). Fit values were found as RMSEA = 0.078, RMR = 0.011, SRMR = 0.076, CFI = 0.94, GFI = 0.85, NFI = 0.90, NNFI = 0.94, IFI = 0.94, RFI = 0.88. The factor loadings of the CFA model of the Turkish version of the CSS-21 were found to be between 0.31 and 0.80 for the first factor and 0.38 and 0.67 for the second factor (Table 3 and Figure 1).

Concurrent validity

To examine the concurrent-related validity, correlations of the CSS-21 and the GSES were calculated. Pearson's analysis indicated that intrinsic and extrinsic scales were negatively correlated with the GSES total score (r= −0.138, p= .035 and −0.126, p= .050, Table 4).

Reliability of the scale

The Cronbach's alpha values of subscales (intrinsic factors and extrinsic factors) were 0.84 and 0.83, respectively. The item-total correlations were found to be between 0.21 and 0.72 for the intrinsic factors and 0.35 and 0.64 for the extrinsic factors.

Table 2. Factor loadings, item analysis, and explained variance.

Items	1. Factor	2. Factor	Item-Subscale Score Correlation
1	0.804		0.711
2	0.671		0.565
3	0.781		0.689
4	0.756		0.649
5	0.812		0.723
6	0.524		0.428
7	0.688		0.628
8	0.615		0.602
9	0.336		0.349
10		0.649	0.524
11		0.695	0.523
12		0.686	0.574
13		0.664	0.545
14		0.792	0.646
15		0.423	0.361
16		0.503	0.450
17		0.547	0.574
18		0.648	0.590
19		0.399	0.369
20	0.316		0.219
21		0.414	0.352
Eigenvalue	6.395	2.510	
Explained variance (%)	30.454	11.953	
Total explained variance (%)	30.454	42.40	

Rotation Method: Varimax with Kaiser Normalization

Table 3. Results of confirmatory factor analysis for the two-factor model (n = 235).

Fit indices	Values obtained from the scale	Result
x^2/df	2.42	Acceptable fit
RMSEA	0.078	Acceptable fit
RMR	0.011	Good fit
SRMR	0.076	Acceptable fit
CFI	0.94	Acceptable fit
GFI	0.85	Acceptable fit
NFI	0.90	Acceptable fit
NNFI	0.93	Acceptable fit
IFI	0.94	Acceptable fit
RFI	0.88	Acceptable fit

RMSEA: Root Mean Square Error Of Approximation; SRMR: Standardized Root-Mean-Square Residual; RMR:Root-Mean-Square Residual; FI: Comparative Fit ındex; GFI: Goodness of Fit Index; NFI: Normed Fit Index; NNFI: Non-Normed Fit Index; IFI: İncremental Fit Index; RFI: Relative Fit Index

According to the split-half analysis, the Spearman-Brown coefficient for the intrinsic subscale was 0.83, the Guttman split-half coefficient was 0.83, the Cronbach's alpha coefficient of the first half was 0.78 and the second half was 0.68, and the correlation coefficient between the two halves was 0.72. The Spearman-Brown coefficient for the extrinsic subscale was 0.83, the Guttman split-half coefficient was 0.83, the Cronbach's alpha coefficient of the first half was 0.66 and the second half was 0.75, and the correlation coefficient between the two halves was 0.72. The floor and ceiling effects were 3% and 1.3% for the intrinsic subscale and 9.4% and 0.4% for the extrinsic subscale (Table 5).

The test-retest reliability of the scale was estimated by administering the same test twice over a 2-weeks to 42 participants selected from the study group. The Pearson product-moment correlation analysis showed that the test-retest correlation coefficients were r = 0.912, *p* = .000 for the intrinsic subscale, and r = 0.938, *p* = .000 for the extrinsic subscale. A positive relationship of high-level significance was found

between the test-retest scores of two subscales (*p* < .01). A paired samples t-test was applied to evaluate the difference between the mean scores obtained from the two measurements, and there was no statistically significant difference between the mean scores of the subscales in the first and second administrations (*p* > .05; Table 6). Hotelling's T^2 value was found to be 454.051, *F* = 20.859, and *p* = .000.

Discussion

This study aimed to determine the reliability and validity of a Turkish version of the CSS-21, which was designed to measure the challenges or problems associated with stopping smoking.

To evaluate the expert opinion on the content validity of the scale, the Davis technique was used. The experts in the literature recommend that both the S-CVI and I-CVI values be greater than 0.80 as evidence of consensus (Alpar, 2018; Yeşilyurt & Çapraz, 2018). In this study, both the S-CVI and I-CVI values were found to be above 0.80. The mean CVI coefficients of the Turkish version of the CSS-21 showed that content validity was fairly good. The analysis also indicated that the experts' scores were consistent and the scale items were culturally appropriate.

Considering the values suggested in the literature, KMO value and Bartlett's sphericity test indicated that the sample size and the data structure were suitable for factor analysis (Seçer, 2015). The eigenvalue was accepted to be greater than or equal to 1.0 for determining the number of factors for the EFA (DeVellis, 2016; Johnson & Christensen, 2019). The two-factor structure was identified for the CSS-21 similar to the original scale. In this two-factor structure, the total explained variance was 42.40%. The literature states that the explained variance ratio in a measurement tool should be at least 40% and above (Johnson & Christensen, 2019). Accordingly, these results showed the obtained total variance of CSS-21 was an acceptable level.

According to the EFA, the factor loads this study were found to be above 0.30 in all subscale and the factor loads on the original scale were found to be over 0.30 (Thomas et al., 2016). It is recommended that the factor load value of each item should be 0.30 and above and items below this value should be excluded from the scale (Seçer, 2015). These results indicated that the factor values in this study had a strong factor structure and were compatible with the original scale factor loads. However, in the original scale, the 20th item belonging to factor 2 was included in factor 1.

The CFA is a method that determines the validity of evidence for the use of an instrument in a culture different from the culture in which it was developed (Tavşancıl, 2019). In the literature, the goodness of fit measures (e.g., GFI, CFI, NFI, NNFI, RFI, and IFI) greater than 0.90 and an RMSEA lower than 0.80 are indicative of a good fit. As a result of the first level CFA in this study, all of the confirmatory factor loadings in subscales were above 0.30 (Seçer, 2015) and the model fit indexes of the two-factor structure of the CSS-21 were found to be a good fit. This study's results indicated that the data were compatible with the scale and confirmed a two-factor structure, the subscales were related to the scale, and the items in each subscale adequately explained its factors. The fit indices for the
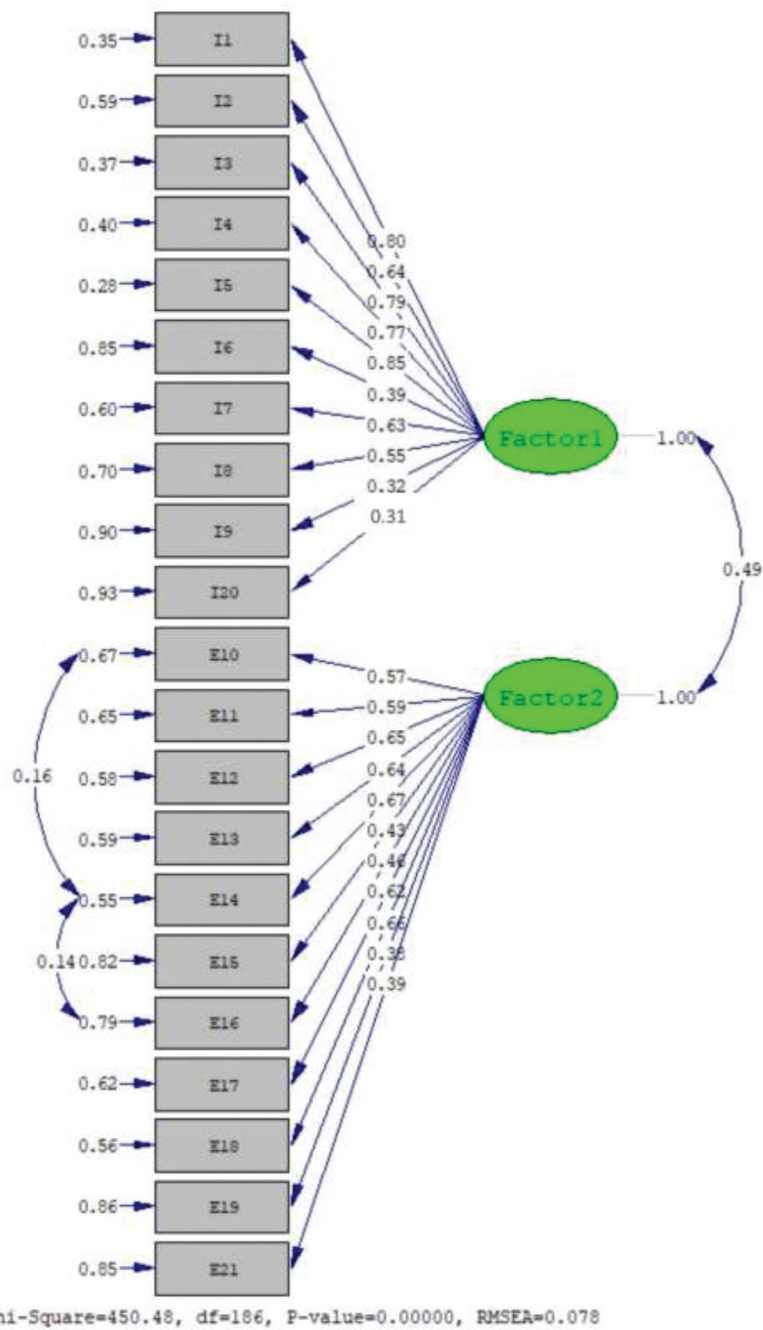
Figure 1. Results of confirmatory factor analysis.

Table 4. Concurrent validity of the CSS-21: correlation with the GSES (n = 235).

| | | Total GSES | | GSES Subscales | | | | | |
| | | | | Initiative | | Persistence | | Effort | |
Scale		r	p	r	p	r	p	r	p
CSS-21 Subscales	Instrinsic Factors	−0.138*	0.035	−0.195**	0.003	−0.097	0.137	0.109	0.094
	Extrinsic Factors	−0.126*	0.050	−0.163*	0.012	−0.085	0.195	0.056	0.396
				M± SD					
		62.66 ± 10.96		32.97 ± 7.40		18.92 ± 3.80		10.77 ± 2.75	

*p < 0.05; **p < 0.01; CSS-21: Challenges to Stopping Smoking Scale; GSES: General Self-Efficacy Scale

original scale were found to be above 0.90 and RMSEAs were below 0.08 (Thomas et al., 2016). It can be said that the two-factor structure that the scale had in its original form was preserved on the Turkish sample.

One way to determine the validity of the scale is to compare it with an equivalent scale. The correlation between the CSS-21′ subscale score and the GSES total score was calculated to examine the criterion correlation validity of the scale. Both

Table 5. Results of reliability for CSS-21 (n = 235).

Factors	Cronbach-a	Spearman-Brown	Guttman split-half	M± SD	Min-Max	Floor effect %	Ceiling effect %
Intrinsic factors	0.84	0.83	0.83	25.6 ± 7.27	10–40	3	1.3
Extrinsic factors	0.83	0.83	0.83	21.5 ± 7.81	11–44	9.4	0.4

Table 6. Comparison of CSS-21's subscales test–retest score means and correlations (n = 42).

Scale		First administration M ± SD	Second administration M ± SD	r	t**	p	Cronbach-a
Subscale	Intrinsic factors	26.18 ± 6.52	25.42 ± 5.40	0.912*	1.589	0.122	0.788
	Extrinsic factors	22.45 ± 6.90	23.27 ± 5.38	0.938*	0.444	0.660	0.742

*p < 0.01 **t-Test in dependent groups.

the intrinsic and extrinsic subscales were correlated with general self-efficacy. It was reported that greater intrinsic and extrinsic challenges were associated with lower self-efficacy.

Reliability

Internal consistency is usually measured with Cronbach's alpha that shows the correlation between responses of items. Many sources state that the minimum acceptable value for Cronbach alpha is 0.70 (DeVellis, 2016; Johnson & Christensen, 2019). In this study, Cronbach alpha values of the CSS-21's subscales were found to be higher than 0.70 as in the original study (Thomas et al., 2016). These results showed that the CSS-21's subscales had a high level of reliability and the items were related to the subject. The results of this study showed that the item-subscale total scores were found to be positive and greater than 0.20 and the scale had a high level of item reliability. Also, the results obtained from this study are similar to those of the original study (Thomas et al., 2016).

According to the split-half analysis, the Cronbach's alpha values of both halves, the Spearman-Brown, and Guttman Split-Half coefficients were > 0.70 (DeVellis, 2016; Johnson & Christensen, 2019). These showed that a strong and significant relationship was determined between the two halves of the scale and the scale had a high level of reliability for the Turkish population.

The test-retest technique was applied to determine the time invariance criterion of reliability. In this study, the test-retest correlation coefficients were 0.91 for the intrinsic subscale and 0.93 for the extrinsic subscale, and there was a positive and strong relationship between the test-retest scores. Also, no significant difference was found between the mean scores obtained from the two measurements. The test-retest results of the current study could not be compared with the findings of the original study because the test-retest analysis was not included in that study (Thomas et al., 2016). According to the test-retest correlation results, it can be said that the results obtained in two-week intervals from the same scale are similar and consistent.

In this study, the Hotelling's T^2 test was used to control whether the item means were different from each other. The findings suggest that the means for scale items are different, the level of difficulty for questions is not equal, responses given by participants for items are not similar, and all items are important for the scale.

In the validity and reliability studies, the floor and ceiling effects show the measurement ability of the dimensions of the scale. It is mentioned that if the floor and ceiling percentages exceed 15%, the subscale of the scale does not measure the desired feature sufficiently (Karagöz, 2016). The current study's results demonstrated that the floor and ceiling effects were lower than 15% and the scale was a reliable measurement tool.

The strength of this scale lies in its short and understandable expressions. This indicates that the scale can be easily applied and interpreted, which ensures convenience for researchers. Also, a parallel-form technique and test-retest technique were used to estimate the reliability of the scale. Although this study has many strengths, the lack of discrimination validity is a limitation.

There are various directions for future research. Nicotine addiction is a global health problem, with potential implications for the quality of life of the smoking user. We believe that it is necessary to determine factors affecting smoking cessation and provide counseling services to help cope with cigarette use. Therefore, CSS-21 can be considered to be a basis for smoking cessation counseling. Nurses or other professionals will be able to identify challenges that have a negative impact on quitting smoking, and healthcare providers will be able to develop interventions specific to the culture for smokers based on results obtained through using this scale.

Conclusion

These results suggest that the Turkish version of the CSS-21 is a reliable and valid tool with the potential for use as a clinical tool to measure the personal and social factors affecting smoking cessation in smokers. As a result of this study, the CSS-21 is composed of 21 items, with each item, except the 20th item, collected under the same subscale as in the original form of the scale. It is thought that the CSS-21 scale can serve as a guide to health professionals when acting to stop or reduce smoking.

Disclosure statement

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