

ORIGINAL ARTICLE

Processes of Change Questionnaire Smoking Version: Psychometric Evidence of Validity and Reliability in Turkish Culture

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Abstract

The aim of this study is to adapt the Processes of Change Questionnaire Smoking Version: Short Form into Turkish. The study comprised 1070 adults from three different samples. The results of the pilot study showed that the translated version was understood well by the Turkish sample. An exploratory factor analysis revealed that the 20-item scale had a 10-factor structure and explained 64.33% of the variance. The confirmatory factor analysis results indicate that the 10-factor model and the two-factor model fit the data well with the Turkish sample. In the reliability analysis, the alpha and omega consistency coefficients of all dimensions ranged from 0.54 to 0.90, besides the test – retest correlation coefficients ranged from 0.34 to 0.75. These results indicate that the reliability of the scale is acceptable. The current study provides evidence that the Turkish version of the PCQ-SV is a reliable and valid instrument to determine smoking behaviors among adult smokers.

Keywords: Addiction, reliability, scale adaptation, smoking, validity

Introduction

Tobacco use is one of the preventable major health problems that claims over 8 million lives worldwide each year (World Health Organization, 2022a). Approximately 7 million of these deaths can be directly linked to tobacco use, and an additional 1.2 million deaths can be attributed to second-hand smoke exposure (World Health Organization, 2022b). Currently, it is estimated that 175 million women and 942 million men aged 15 and over smoke worldwide (Drope et al., 2018). In line with this, according to a recent report from the Turkish state statistical institute, 41% of men, 14% of women, and 28% of the entire population aged 15 years and older smoke in Türkiye (TUIK, 2019). Tobacco

addiction is a substance use disorder according to the American Psychiatric Association's (2013) diagnostic criteria and is considered one of the main causes of deaths and diseases due to substance use disorders (Ziedonis et al., 2006).

Various intervention programs have been developed to help people quit smoking, but they have not been found successful enough (West, 2017). A considerable majority of smokers quit smoking on their own without professional help (Etter et al., 2000). Those who quit smoking by their own efforts reported using more successful strategies to prevent relapse (Perri et al., 1977). Providing information on how to quit smoking with self-help and how to prevent relapse may be helpful in developing

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more effective intervention models to quit smoking (Prochaska et al., 1992).

Successful strategies for quitting smoking are often characterized by some specific behavioral change models (Prochaska & Velicer, 1997). One of these models is the transtheoretical model (TTM). The model, built on stages of change, explains how people change a problematic behavior or acquire a positive behavior (Velicer et al., 1998). The main components of the TTM are the stages of change that include “precontemplation,” “contemplation,” “preparation,” “action,” “maintenance.” Moreover, the processes of change, such as “consciousness stimulation,” “emotional arousal,” “self-reappraisal,” “environmental reappraisal,” “personal enlightenment,” “getting help from relationships,” “counter-conditioning,” “stimulus control,” “reinforcement management,” and “social enlightenment,” are the other components of the model (Prochaska & DiClemente, 1982).

Over the past few decades, research and experiments have suggested that TTM is a guiding model with its theoretical framework dimension in changing smoking, overeating, and physical exercise behaviors and in realizing these changes (DiClemente et al., 1991). In this regard, various tools have been developed to measure the extent to which TTM can change people’s lifestyles (e.g., physical activity, nutrition, weight loss, and smoking). Accordingly, Hoepfner et al. (2006) developed a short form to measure the stages of change in adolescents’ smoking cessation processes. It is anticipated that this assessment method can also be employed for evaluating particular habits like diet and reducing sun exposure.

A review of the literature reveals that some TTM-based scales have already been adapted to Turkish culture. One of them is the short form developed by Hoepfner et al. (2006) to measure the stages of change in adolescents’ smoking cessation processes, and it was adapted to Turkish culture by Çelik (2014). Another measurement tool is the Decision-Making Balance Scale developed by Velicer et al (1985) and was adapted to Turkish culture by Yalçınkaya-Alkar and Karanci (2007). Next, the Fagerström Nicotine Addiction Scale developed by Fagerstrom and Schneider (1989) was adapted into Turkish by Uysal et al. (2004). Furthermore, the Self-Efficacy Scale developed by Velicer et al. (1990) to measure an individual’s ability to stop smoking and success in changing his/her behavior was adapted to Turkish culture by Erol (2005). Apart from the adaptation studies, Erdogan and Kurcer (2020) also developed the Smoking Cessation Scale According to the Health Belief Model (SCS-HBM) in the Turkish language. However, a number of different scales that directly relate smoking behavior to the stages of change model have been developed in various contexts (Sarbandi et al., 2013; Velicer et al., 1985). Such instruments provide concrete information about the stages of planned behavior. It is apparent that there is a dire need for measurement tools that can be used for planned behavior change studies in Türkiye, where the prevalence of tobacco use is still an important public health problem. All in all, it is of cardinal importance to develop scales or adapt existing scales to Turkish culture in order to provide specific criteria for reducing or quitting tobacco use.

The Processes of Change Scale Cigarette Form focuses on the change processes of individuals at five different smoking

cessation stages, which are “precontemplation,” “contemplation,” “preparation,” “action,” and “maintenance” (Prochaska et al., 1988). This measurement instrument was developed based on data obtained from both current smokers and individuals who quit smoking by their own efforts. The scale is basically a self-report scale consisting of two main factors: experiential (cognitive) processes and behavioral processes, with 10 factors under each factor. The scale has been adapted to different cultures and used in numerous studies on smoking addiction (Hoepfner et al., 2006; Sarbandi et al., 2013; Yasin et al., 2011). There is no Turkish culture-adapted version available for a smoking scale based on Processes of Change prepared for the adult age group in Türkiye. The aim of this study is to carry out the psychometric procedures necessary for the adaptation of the short form (Fava et al., 1991) of the Smoking Version of the Processes of Change Scale, which was developed by Prochaska et al. (1988) based on the transtheoretical model into Turkish culture. It is believed that the adaptation of this scale, which is used widely in different societies, into Turkish culture will contribute to both the research literature in Türkiye as well as international comparative studies.

Material and Methods

Methodology

Participants

Three separate groups of subjects were recruited for different stages of the study. The piloting group consisted of 316 adults aged 18 – 72 years (mean = 34.79, SD = 10.75). Exploratory factor analysis (EFA) was performed with the second set of 403 adults between the ages of 18 and 61 (mean = 30.51, SD = 10.43). Confirmatory factor analysis (CFA) of the main study was tested with the last group of 351 adults between the ages of 18 and 63 (mean = 30.77, SD = 10.47). The pilot study and actual factor analyses were conducted on the data gathered from these three separate groups of participants. It should be noted that the participants were recruited by convenience sampling. Only smokers and former smokers who had quit smoking were included in the study. Information on demographics and smoking experiences of the research groups is presented in Table 1.

Measuring Instruments

Personal Information Form

The researchers created the form in order to gather certain demographic data about the participants and included questions about gender, age, education level, smoking status, average number of cigarettes smoked per day, smoking duration, previous attempts at quitting, and current smoking cessation attempt.

Processes of Change Scale Cigarette Version-Short Form

The Processes of Change Scale Cigarette Version-Short Form (PCS-CV-SF) focuses on the change processes of individuals in five different stages of smoking cessation (“precontemplation,” “contemplation,” “preparation,” “action,” and “maintenance”) (Fava et al., 1991; Prochaska et al., 1988). The measuring instrument was developed based on data obtained from both current smokers and individuals who quit smoking with self-help. The scale consists of 10 factors (“Consciousness Raising,” “Dramatic Relief,” “Self Re-evaluation,” “Environmental Re-evaluation,” “Self Liberation,” “Helping Relationships,” “Counter Conditioning,” “Stimulus Control,” “Reinforcement

Table 1.
Information on Participants' Demographics and Smoking Experiences

	Pilot Study Sample		Main Study EFA Sample		Main Study CFA Sample	
	f	%	f	%	f	%
Gender						
Female	145	45.9	191	47.4	181	51.6
Male	171	54.1	212	52.6	170	48.4
Education level						
Primary school and below	7	2.2	3	0.7	3	0.9
Secondary school	6	1.9	8	2.0	4	1.1
High school	37	11.7	33	8.2	33	9.4
University	204	64.6	312	77.4	263	74.9
Post-graduate	62	19.6	47	11.7	48	13.7
Smoking status						
Occasionally	61	19.3	129	32.0	119	33.9
At least 1 cigarette a day	218	69.0	211	52.4	181	51.6
I used to smoke but I quit	37	11.7	63	15.6	51	14.5
Duration of smoking						
Less than 1 year	14	4.4	53	13.2	46	13.1
1 – 3 years	22	7.0	60	14.5	55	15.0
3 – 5 years	34	10.8	71	18.0	61	18.1
5 years and above	246	77.8	219	54.3	189	53.8
Average number of cigarettes smoked per day						
1 – 10 pcs	118	37.3	209	39.2	160	45.6
11 – 20 pcs	112	35.4	159	38.9	125	35.6
More than 20 pcs	55	17.4	35	9.2	26	7.4
I don't smoke right now	31	9.8	51	12.7	40	11.4
Stages of change						
Pre-contemplation	171	54.1	184	45.7	193	55.0
Contemplation and preparation	109	34.5	130	32.3	93	26.5
Action and maintenance	36	11.4	89	22.0	65	18.5
Total	316	100	403	100	351	100

Note: CFA, confirmatory factor analysis; EFA, exploratory factor analysis.

Management,” and “Social Liberation”) and includes five-point Likert type items. The first five of these sub-factors constitute a dimension under the name of experiential (i.e., thought-related) processes, while the other five sub-factors are grouped under the name of behavioral processes. The construct validity coefficients of the factors obtained from the long version of the scale vary between 0.34 and 0.72. The two lowest coefficients appeared on the factors of self-liberation (0.36) and social-liberation (0.34). The correlation coefficient between the sub-factors of the scale is 0.30. Cronbach alpha (α) internal consistency coefficients were calculated for each of the factors separately and it was found that the coefficients varied between 0.69 and 0.72. Six months after the first data collection, data were collected from another sample for a second time to conduct the CFA with the LISREL IV computer software. The analysis resulted in a model linking

two secondary factors with 10 primary factors (Prochaska et al., 1988).

Procedure

Necessary permissions were obtained from the scale owners for the Processes of Change Scale Cigarette Form to be adapted to Turkish culture. Ethics approval was granted by Trabzon University (No: E-81614018-000-2200011483, date: 2022). Then, the scale adaptation stages suggested by Hambleton (1996) were implemented. The first stage involved translating the scale items from the original language (English) into the target language (Turkish). For this purpose, in the first translation of the scale, four different experts who have a good command of both languages and cultures and who also have experience in scale development and adaptation independently translated the scale items

into Turkish. Afterward, the consistency between the translations was examined by a group of faculty members working in the psychological counseling, Turkish, and English as a foreign language teaching departments, and thus the Turkish form of the scale was created. This Turkish form was also translated back into English by an independent translator who has a good command of English and Turkish. The Turkish form of the scale was revised by the researchers by re-examining whether there were any inconsistencies between the original items of the scale and the back translation. The language and content validity of the final Turkish form was evaluated by a group of 10 experts working in the departments of English as a foreign language teaching, Turkish language teaching, psychological counseling, and assessment and evaluation. A pilot study was conducted with the Turkish form of the scale approved by the expert group. In addition to scoring the scale items, the participants in the pilot study were also asked to express their opinions about the items that were not easily understood. The data obtained were analyzed and the items were found to be linguistically and psychometrically appropriate. After these procedures, the final version of the Turkish form of the PCS-CV-SF was created and the data collection phase for the main study began.

Adult volunteer smokers and quitters were recruited to participate in the study by convenience sampling. Online forms (Google Forms) were utilized in the data collected from all around Türkiye. Before the survey, a consent form that explained the purpose and scope of the study and participant rights was presented to the participants. In compliance with ethical rules, data were collected anonymously, and only those who wanted to participate in the retest study were asked to provide their contact information.

Data Analysis

IBM Statistical Package for social sciences (IBM SPSS Corp.; Armonk, NY, USA) 26 and Analysis of moment structures (AMOS) 20 programs were used to analyze the data in this adaptation study. Before proceeding with the analyses of the study, normality tests were computed for the data obtained for the PCS-SV, and the kurtosis values were found to be -0.21 , -0.11 , and -0.01 , and skewness values were found to be 0.10 , 0.17 , and 0.04 for the pilot, EFA, and CFA samples, respectively. The obtained kurtosis and skewness coefficients were within acceptable ranges (± 1) (Tabachnick & Fidell, 2015).

Cronbach's α and McDonald's ω were calculated for the reliability of the scale. In addition, its reliability over time was also tested with the test – retest model. Validity of these measures was established through EFA and CFA. In determining the adequacy of the model tested with CFA, chi-square goodness, goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), CFI, root mean square error of approximation (RMSEA) and standardized root mean square residual (SRMR) were used (Byrne, 2010).

Findings

Findings of the Pilot Study

A pilot study was conducted to see whether the Turkish form of the scale was understood by the adult sample and how the scale items were evaluated. Initially, the data obtained from the pilot study were tested with Kaiser – Meyer – Olkin (KMO) and Bartlett tests to find out whether they were at an adequate level

for factor analysis. Results revealed that the data set was suitable for factor analysis ($KMO = 0.85$ and Bartlett $X^2 = 2547.97$, $df = 190$, $p < .001$). Based on the principal axes analysis using the promax rotation method, it was determined that the 10-factor structure explained 64.76% of the total variance. It was also found that the items were distributed in a way that was exactly compatible with the 10 factors in the original form of the scale. Among the items with factor loadings ranging between 0.35 and 0.97, only item 7 cross-loaded on two factors. Confirmatory factor analysis was conducted for the 10-factor structure obtained from the pilot study data. The goodness of fit values obtained after the suggested modifications were made are as follows: X^2/df 1.72 ($X^2 = 215.18$, $df = 125$, $p < .001$), RMSEA = 0.05, GFI = 0.94, AGFI = 0.90, CFI = 0.96, SRMR = 0.04. These results indicate a good fit of the model to the data.

At this stage, the reliability values of the scale were tested. The internal consistency coefficient calculated for the whole scale was $\alpha = 0.88$ and $\omega = 0.89$. Item – total correlations were calculated, and the values were found to be in the range of 0.88 – 0.89. Thus, it was determined that removing any item would not create a significant change in internal consistency. Moreover, the reliability values calculated for the sub-factors ranged between 0.55 and 0.81.

In line with the findings obtained from the validity and reliability analysis of the pilot study, cross-loaded items, items with reliability values slightly below the expected values, and items that were found to be confusing by the participants during the application were re-examined. Some wording revisions were made to the items by the researchers of the project, and the final version of the Turkish form to be used in the main study was created.

Findings Regarding the Construct Validity of the Processes of Change Scale Cigarette Version-Short Form

Exploratory factor analysis was conducted to test the construct validity of the PCS-CV-SF. Initially, KMO coefficient and Bartlett's sphericity test results were examined to test the suitability of the data obtained from the EFA sample for factor analysis. The obtained values show that the sample suitability is sufficient ($KMO = 0.87$) and the scale items have a multivariate normal distribution ($X^2 = 3559.14$, $df = 190$, $p < .001$). In addition, the cross-correlations of the scale items in the anti-image matrix were examined and it was determined that the values ranging between 0.76 and 0.94 were of sufficient magnitude (>0.50) (Tabachnick & Fidell, 2015).

In order to determine the factor structure of the scale, principal axes analysis and promax rotation method, mainly preferred when sub-factors are related to each other, were used. Results indicate that the 10-factor structure in the original form of the scale showed an appropriate and strong distribution. In the 10-factor structure, where 64.33% of the total variance was explained, item distributions were similar to those in the original form and the pilot study. The sub-factors were named similarly to those in the original form. The factors to which the items in the scale belonged, the common variance of each item, and their correlations with the total score are shown in Table 2.

The goodness of fit values of the 10-factor structure obtained from the EFA of PCS-CV-SF with the data set obtained from a different sample were checked by CFA. The goodness of fit values

Table 2.
Factor Analysis Results of the Processes of Change Scale Cigarette Version Short Form

Factors and Items	Eigenvalues	Explained Variance (%)	Factor Loading	Communalities	Item – Total Correlations
<i>Factor 1. Consciousness raising</i>	1.08	5.37			
Item 4			0.64	0.62	0.56
Item 11			0.46	0.56	0.62
<i>Factor 2. Dramatic relief</i>	1.32	6.60			
Item 7			0.58	0.69	0.67
Item 18			0.76	0.77	0.55
<i>Factor 3. Environmental re-evaluation</i>	1.50	7.52			
Item 6			0.79	0.79	0.51
Item 12			0.77	0.72	0.51
<i>Factor 4. Self re-evaluation</i>	1.27	6.37			
Item 8			0.68	0.69	0.61
Item 15			0.57	0.50	0.46
<i>Factor 5. Social liberation</i>	1.09	5.43			
Item 3			0.64	0.49	0.38
Item 14			0.58	0.45	0.43
<i>Factor 6. Reinforcement management</i>	1.19	5.93			
Item 5			0.65	0.52	0.42
Item 20			0.64	0.61	0.53
<i>Factor 7. Counter conditioning</i>	1.22	6.12			
Item 1			0.46	0.64	0.69
Item 17			0.65	0.70	0.61
<i>Factor 8. Helping relationships</i>	1.23	6.14			
Item 10			0.63	0.47	0.32
Item 16			0.81	0.67	0.27
<i>Factor 9. Self liberation</i>	1.53	7.67			
Item 2			0.77	0.69	0.40
Item 13			0.81	0.78	0.49
<i>Factor 10. Stimulus control</i>	1.44	7.18			
Item 19			0.73	0.74	0.62
Item 9			0.64	0.78	0.71

Explained total variance of PCQ-SV = 64.33%.

determined with the CFA sample were $\chi^2/df = 1.60$ ($\chi^2 = 200.04$, $df = 125$, $p < .001$), GFI = 0.95, AGFI = 0.91, CFI = 0.97, RMSEA = 0.04, and SRMR = 0.03. The values obtained and the criteria of goodness of fit indices frequently used in the literature (Hu & Bentler, 1999) are presented in Table 3. Accordingly, it would not be unwise to claim that the model with 10 factors and 20 items obtained from the Turkish sample shows excellent fit with the data. The standardized coefficients showing the relationship between the items and their factors ranged between 0.64 and 0.92,

and all of them were significant at the 0.01 level. The factor loadings of the model are shown in Figure 1.

The original classification of the 10-factor structure of the scale, in which the first 5 factors are experiential (cognitive) processes and the last five sub-factors are behavioral processes, was also tested in the Turkish sample, and the results are presented in Table 4. The goodness of fit values found for the second-level factor structure tested on the CFA sample of the study were χ^2/df

Table 3.
Confirmatory Factor Analysis Results of Processes of Change Scale Cigarette Version Short Form

Fit Index	Excellent Fit	Acceptable Fit	Value in First Level Factor Analysis	Value in Second Level Factor Analysis
χ^2/SD	≤ 2	≤ 5	1.60	2.00
GFI	>0.90	>0.85	0.95	0.92
AGFI	>0.90	>0.80	0.91	0.89
CFI	>0.95	>0.90	0.97	0.94
RMSEA	≤ 0.05	≤ 0.08	0.04	0.05
SRMR	≤ 0.05	≤ 0.10	0.03	0.06

χ^2 = chi-square; AGFI, adjusted goodness-of-fit index; CFI, comparative fit index; GFI, goodness-of-fit index; RMSEA, root mean square error of approximation; SRMR, standardized root mean square residual.

= 2.00 ($\chi^2 = 218.24, df = 159, p < .001$), GFI = 0.92, AGFI = 0.89, CFI = 0.94, RMSEA = 0.05, and SRMR = 0.06, respectively. The values obtained show that the data collected from the Turkish sample show a good fit for the model, including two main factors (Byrne, 2010; Hu & Bentler, 1999). The standardized coefficients showing the relationship between the items and their factors ranged between 0.28 and 0.92, and all of them were significant at the 0.01 level. The factor loadings of the model are shown in Figure 2.

Findings Regarding the Reliability of PCS-CV-SF

In order to test the reliability of the Turkish form of the PCS-CV-SF, Cronbach's α internal consistency coefficient and McDonald's ω values were calculated separately for EFA and CFA samples, and the results are summarized in Table 4. The internal consistency coefficient obtained for the whole scale

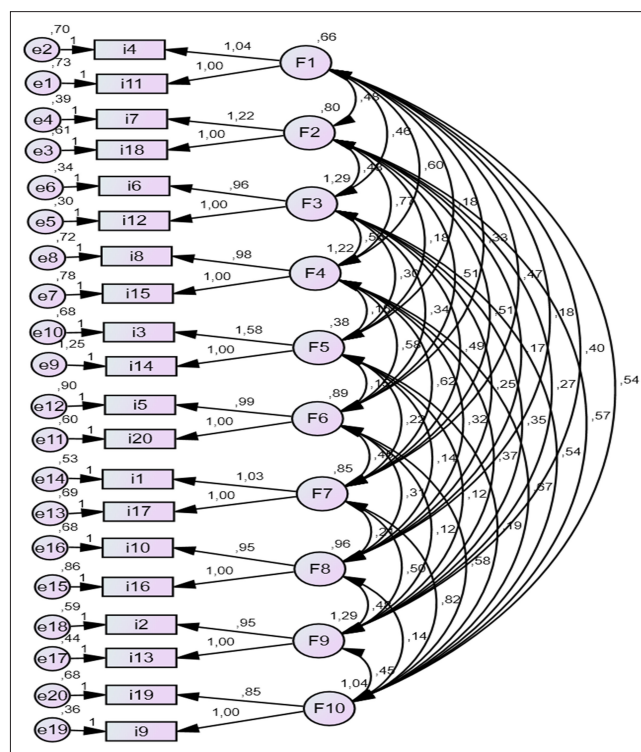


Figure 1. First Level Confirmatory Factor Analysis Diagram for the Main Study of the Processes of Change Scale Cigarette Version.

consisting of 20 items was $\alpha = 0.89$ in the EFA group and $\alpha = 0.88$ in the CFA group. The McDonald's ω coefficient was 0.90 in the EFA group and 0.89 in the CFA group. The α and ω coefficients calculated for the sub-factors were found to be at similar levels in the EFA and CFA groups with different samples. According to the analysis results in Table 4, the reliability coefficients obtained for the sub-factors ranged between 0.54 and 0.89.

Table 4.
Reliability Analysis Results of the PCS-CV-SF

Factor	Cronbach Alpha (α)		McDonald's Omega (ω)		Test – Re-test (r)
	EFA Sample	CFA Sample	EFA Sample	CFA Sample	
Consciousness raising	0.65	0.66	0.65	0.66	0.52
Dramatic relief	0.80	0.79	0.80	0.79	0.68
Environmental re-evaluation	0.84	0.89	0.84	0.89	0.64
Self re-evaluation	0.72	0.76	0.72	0.76	0.45
Social liberation	0.62	0.54	0.62	0.54	0.34
Reinforcement management	0.69	0.70	0.69	0.70	0.61
Counter conditioning	0.76	0.74	0.76	0.74	0.35
Helping relationships	0.70	0.70	0.70	0.71	0.78
Self liberation	0.83	0.83	0.83	0.83	0.54
Stimulus control	0.85	0.77	0.85	0.77	0.64
Cognitive processes	0.85	0.83	0.85	0.83	0.73
Experiential processes	0.82	0.80	0.83	0.81	0.75
Processes of change scale cigarette version short form total	0.89	0.88	0.90	0.89	0.75

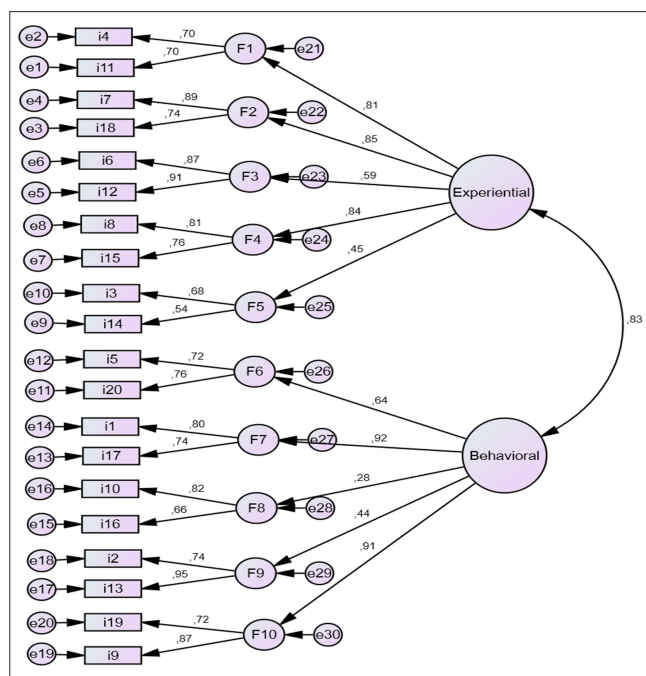


Figure 2. Second Level Confirmatory Factor Analysis Diagram for the Main Study of the Processes of Change Scale Cigarette Version.

Test – retest correlations were calculated in order to assess the scale’s long-term consistency. For this purpose, the scale was administered to a group of 46 (19 female 41.3%, 27 male 58.7%) adult smokers or adults with previous smoking experience (age mean = 21.28 ± 2.33) at 3-week intervals, and the results were analyzed. The test – retest reliability coefficient of PCS-CV-SF was found to be high at 0.75. The correlations between the 3-week intervals calculated for the sub-factors were between 0.34 and 0.78. Accordingly, it can be said that the reliability of the PCS-CV-SF over time is at an acceptable level.

Discussion

In this study, the psychometric procedures necessary for the adaptation of the PCS-CV-SF, developed based on the transtheoretical model, to the Turkish population were carried out. Scale adaptation studies are frequently preferred in behavioral research. Scale adaptation studies are considered advantageous because a test with known psychometric properties is more reliable than a newly developed test, saves researchers time and money, and allows cross-cultural comparisons (Hambleton & Patsula, 1999).

One of the most crucial phases of scale adaptation studies is cultural adaptation, which involves the lengthy and difficult processes of translation (Hambleton, 1996). Every effort was made in this study to guarantee that the scale could be adapted in a way that would be beneficial and yield positive outcomes in future research. A pilot study was carried out to assess the validity and reliability of the scale following the language controls. The exploratory and CFA results obtained from the pilot sample generally revealed good agreement, and only minor linguistic revisions were made for the actual study.

The sampling adequacy was assessed using the KMO coefficient and Bartlett’s test of sphericity in the EFA carried out

to test construct validity in the actual adaptation study of the PCS-CV-SF. These tests are measures of factorability; the KMO value should be higher than 0.60, and the significance level of Bartlett’s test should be less than 0.05. (Brace et al., 2003). The values obtained in this study were found to be within the ranges specified in the literature. As a result of the EFA, it was determined that the 10-factor structure showed a one-to-one fit with the original form and explained 64.33% of the total variance. In behavioral sciences, a scale explaining at least 40% of the variance is deemed sufficient (Şencan, 2005). Accordingly, it can be assumed that the variance explained by the PCS-CV-SF is at a good level. In addition, the factor loadings obtained as a result of EFA were found to be between 0.46 and 0.81, and these values were found to have the factor power recommended in the extant literature (Tabachnick & Fidell, 2015). It can thus be suggested that the factor loadings in the EFA results of the long form of the PCS-CV are between 0.40 and 0.83 (Prochaska et al., 1988) and are similar to this study.

The goodness of fit values of the 10-factor structure obtained from the EFA of the PCS-CV-SF with the data set obtained from a different sample were checked with CFA. The original form of the scale also had a 10-factor structure. It would be fair to claim that the obtained goodness of fit values ($\chi^2/df = 1.90$, GFI = 0.95, AGFI = 0.91, CFI = 0.97, RMSEA = 0.05, and SRMR = 0.04) showed excellent fit according to the criteria determined in the related literature (Byrne, 2010; Hu & Bentler, 1999). A second-level CFA was conducted to determine whether the model, in which the 10-factor structure in the original form of the scale was grouped under two main dimensions, would be confirmed in the Turkish sample. Accordingly, the values obtained from the second-level CFA ($\chi^2/df = 2.00$, GFI = 0.92, AGFI = 0.89, CFI = 0.94, RMSEA = 0.05, and SRMR = 0.06) were within acceptable ranges and showed good fit with the Turkish sample. Furthermore, the goodness of fit indices obtained in this study are similar to the original long form of the scale developed by Prochaska et al. (1988). The GFI value found for the 10-factor structure in the original form was 0.88, and the GFI value found for the second-level analysis in which these 10 factors were grouped under two main factors was 0.89. In an adaptation study (Sarbandi et al., 2013) conducted with an Iranian sample, only first-level CFA was performed for construct validity and good fit results ($\chi^2/SD = 1.91$, GFI = 0.92, CFI = 0.91, RMSEA = 0.06) were obtained for the 10-factor structure. The values obtained from the Iranian sample of the scale are in line with those of this study. In another study (Hoeppner et al., 2006), in which the validity and reliability of the short form of the PCS-CV-SF was tested on adolescents, second-order factor analysis procedures were performed and goodness of fit values ($\chi^2/df = 6.06$ CFI = 0.92, RMSEA = 0.08) were found to be consistent with the values found in this study. Çelik (2014) adapted the Turkish version of the PCS-CV-SF for adolescents and conducted both first- and second-level confirmatory factor analyses in his study and obtained very good fit values similar to the results of this study.

The results of the factor analysis conducted in the pilot and main study provided evidence for the validity of the structure of the 20-item scale, which includes 10 sub-factors under two main factors, in the Turkish sample. As in its original form, the PCS-CV-SF consists of 10 sub-factors under the main dimension

of experiential processes: “mindfulness-consciousness raising,” “emotional arousal,” “dramatic relief,” “environmental re-evaluation,” and “social liberation” and under the main dimension of behavioral processes: “reinforcement management,” “counter-conditioning,” “helping relationships,” “self liberation,” and “stimulus control.”

The reliability of the PCS-CV-SF was analyzed with Cronbach’s α and McDonald’s ω coefficients, which are frequently preferred in multiple rating instruments (Yurdugül, 2006). Reliability analyses were calculated separately in EFA and CFA groups, which are different samples. In addition, test – retest correlations were examined to test the reliability of the test over time. Cronbach’s internal consistency coefficient for the whole scale was 0.89 in the EFA group and 0.88 in the CFA group. McDonald’s ω coefficient was found to be 0.90 in the EFA group and 0.89 in the CFA group. The reliability coefficients obtained for each sub-factor ranged between 0.54 and 0.89. Considering that the reliability level for measurement tools to be used in research is deemed 0.60 and above, these values are within acceptable limits (Büyüköztürk, 2002; Kalaycı, 2010). It was found that the reliability values of “Social Liberation,” one of the sub-factors in the scale, have the lowest values among the other sub-factors, with 0.54 and 0.60. This sub-factor was reported to be at a similarly low level in the original long form of the scale (Prochaska et al., 1988) and in the adaptation of the short form for adolescents (Hoepfner et al., 2006). Hoepfner et al. (2006) developed a short form to measure the processes of change in adolescents’ smoking cessation processes, with sub-factor values ranging between 0.60 and 0.89. In the same form, the reliability coefficient of the “Social Liberation” sub-factor was found to be 0.60. Sarbandi et al. (2013) aimed to test the validity and reliability of the Persian version of the Processes of Change Scale Cigarette Version developed by Prochaska et al. (1988) and found the factor values of the sub-factors of the scale to be between 0.60 and 0.84. Çelik (2014) adapted the adolescent form of the scale to Turkish culture and found that the lowest coefficients were “Social Liberation” and “Emotional Arousal,” with 0.60 and 0.61. These results show that the scale yielded results in parallel with similar studies.

The test – retest reliability of the scale was conducted as a measure of the stability of the instrument. The test – retest reliability coefficient was found to be at a high level with 0.75. The correlations between the 3-week intervals calculated for the sub-dimensions were between 0.34 and 0.78. Although the original form of the scale does not have analysis results of the repetition of the test, the validity and reliability study of the scale conducted with the Malaysian sample (Yasin et al., 2011) showed test – retest correlations of 0.35 and 0.70, similar to this study. These findings suggest that the PCS-CV-SF adapted to Turkish can be used to measure adults’ smoking behavior change. In this regard, it is thought that the findings obtained from the present study may be useful both for smokers and for those involved in tobacco cessation programs. The measurement tool obtained from this study can be used in designing smoking cessation intervention programs and scientific research on smoking in Türkiye, where smoking rates are quite high.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethics Committee Approval: This study was approved by the Ethics Committee of Trabzon University (Approval no.: E-81614018-000-2200011483, Date: 2022).

Informed Consent: Written informed consent was obtained from the participants who agreed to take part in the study.

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