

# Examination of the Psychometric Properties of the Persian Version of the Challenges to Stopping Smoking Scale (CSS) in Patients with Cardiovascular Disease (CVD)

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**Background:** Smoking is one of the modifiable risk factors for cardiovascular disease (CVD) that is related to different types of chronic disorders. Many patients with CVD consider smoking cessation a difficult task due to various reasons. The goal of the present study was to translate the Challenges to Stopping Smoking Scale (CSS) into Persian and examine its psychometric properties.

**Materials and Methods:** In this cross-sectional methodological study, a total of 341 patients with CVD [141 for exploratory factor analysis (EFA) and 200 for confirmatory factor analysis (CFA)] participated, and were selected using a convenience sampling method. Participants completed the Persian version of the CSS. Face, content, and construct validities were examined. Internal consistency was assessed using the McDonald's Omega and Cronbach's alpha coefficients, and stability was examined using the test-retest method.

**Results:** In the EFA, two factors of Internal Challenges and External Challenges were extracted that together explained 42.619% of the total variance. Cronbach's alpha coefficients of 0.740 and 0.799 and Intraclass correlation coefficients of 0.862 and 0.869 were found for Internal and External Challenges, respectively. According to the results of CFA, the three-factor model had a good fit to the data. (RMSEA: 0.059; CFI: 0.94; GFI: 0.97; NFI: 0.90; PNFI: 0.77).

**Conclusion:** The Persian version of the CSS has good validity and reliability, and can be used as a valid and reliable instrument in future studies.

**Keywords:** Psychometric evaluation; Challenges to Stopping Smoking; Smoking; CVD

## INTRODUCTION

Cardiovascular disease (CVD) is one of the leading causes of death throughout the world. One out of every three deaths in the US is caused by CVD. The CVD death rate is higher than the rate of death from all types of cancer and respiratory illnesses (1, 2). Its mortality rate has increased by 14.5% from 2006 to 2016 (3). The risk of developing CVD can be reduced by modifying several risk

factors, including lack of physical activity, obesity, poor nutrition, hypertension, and diabetes (4).

Smoking is one of the modifiable risk factors of CVD that is related to different types of cancer and chronic respiratory and cardiovascular conditions (5). Cardiovascular disease accounts for more than 17 million deaths globally each year, more than 10% of which are estimated to be caused by cigarette smoke (6). About one

billion adults throughout the world smoke. Given the current rate of population growth, the number of smokers increases day by day (7-9). From 2009 to 2014, the number of smokers who smoked 1-5 cigarettes per day increased from 18% to 23.5% (8).

Although many smokers wish to quit smoking, quitting smoking is not easy, and more than half of smokers in the US, 30% of smokers in Australia, and 26% of smokers in the UK have reported unsuccessful efforts to quit smoking in the past 12 months (10). Keto et al. consider strong addiction to nicotine the main cause of unsuccessful smoking cessation (6). Various factors may influence smoking cessation. Some studies have referred to personal limitations in smoking cessation such as withdrawal symptoms, addiction, high levels of perceived stress, and self-doubt (11-14). Some other studies have pointed out the role of environmental factors, such as worrying about weight gain, poor knowledge, lack of support from family and society, high cost of nicotine replacement therapies, lack of support from health professionals, social pressure to smoke, and perceived social deprivations after quitting smoking (10-15). Identification of personal and environmental factors influencing smoking cessation can help in choosing supportive strategies that can increase the chance of smoking cessation (8).

Many of these smoker patients are aware that continued smoking exacerbates their cardiovascular disease and increases their chances of developing other diseases. Despite the desire to quit smoking, most patients fail due to several challenges along the way. Identifying these challenges can help health professionals and health officials provide the necessary interventions to quit smoking and prevent exacerbation of the disease in these patients. Identification of different challenges to smoking cessation requires valid and reliable instruments. A review of the literature showed that instruments used by previous studies on smoking cessation were either invalidated (16, 17) or did not assess challenges experienced when trying to quit smoking (18, 19). The Challenges to Stop Smoking Scale (CSS) is a new, valid, and reliable instrument

assessing internal and external challenges to smoking cessation (10).

Given the lack of proper instruments to assess this variable, and considering that challenges to smoking cessation change over time and new instruments are needed to assess the current challenges, the present study is aimed at examining the psychometric properties of the Persian version of the Challenges to stopping smoking scale (CSS) in patients with cardiovascular disease (CVD).

## **MATERIALS AND METHODS**

### **Study design**

This is a methodological study with a cross-sectional design.

### **Participants**

A number of 5-10 participants per item are needed for conducting exploratory factor analysis (EFA) (20). The participants included 341 patients with CVD who were selected using a convenience sampling method among the patients of Tohid Hospital in Sanandaj. The inclusion criteria were as follows: smoking cigarettes currently or previously, ability to read and write, and age over 18 years. Incomplete questionnaires were excluded from the analysis.

### **Measurement instruments**

The Challenges to Stop Smoking scale (CSS) has 21 items and two dimensions. In the EFA of the original version of the scale, two factors of internal challenges (9 items) and external challenges (12 items) were extracted that together explained 50.7% of the total variance. In addition, internal consistencies of 0.86 and 0.82 were found for the internal and external challenges, respectively. Moreover, according to the results of CFA, all of the fit indices assessed were in the acceptable range (10).

### **Translation**

Translation of the scale was conducted based on the WHO guidelines (21). First, necessary permissions were obtained from the author. Then, the English version of the CSS was translated into Persian by two independent translators, using the Forward-backward translation

method. In the next step, the two translations were compared to each other to develop the final Persian version of the scale. Then, the Persian version was translated into English by two other translators. The two English translations were compared to each other, and after making necessary modifications, the final English version of the CSS was developed.

### Face and content validities

To examine face validity, the Persian version of the CSS was completed by 10 qualified patients with CVD, and the items were modified according to their feedback on the complexity and comprehensibility of the items. To assess content validity, the scale was sent to 10 experts who had seminal papers on CVD and smoking cessation, and modifications were made to the items based on their feedback. In addition, item analysis was used to identify which items influenced reliability. Because the purpose of the present study was to report the psychometric properties of the Persian version of CSS, face, and content validations were performed qualitatively because we were not allowed to remove or add items to the original version.

### Construct validity

Exploratory factor analysis (EFA) was used to examine the construct validity of the CSS. The main purpose of EFA is to identify the basic relationships between the measured variables. It is used in scale development when the researcher(s) has no previous hypotheses about the factors or patterns of the measured variables (22).

The minimum sample size for performing EFA is 3-10 participants per item (23). The main factors were extracted using the Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity that were performed using the SPSS software, version 16. KMO values closer to 1 indicate better sampling adequacy for factor analysis (24). KMO values ranging from 0.7 to 0.8 are good and from 0.8 to 0.9 are excellent (25). Bartlett's test of sphericity is also used to assess sampling adequacy (26). Construct validity was assessed using Confirmatory factor analysis (CFA). The purpose of CFA is to examine the factor structure of a set of observed variables and allow the researcher(s) to test the hypothesis

that there is a relationship between the observed variables and their underlying latent structures (22). In the second sampling, the extracted factors were examined using the CFA, and the common fit indices were assessed using the Lisrel software, version 8.8.

### Internal consistency

Considering the limitations of Cronbach's alpha coefficient in assessing internal consistency when there is a large number of an item or a large sample, the McDonald's omega coefficient will also be calculated. It is calculated according to the output of EFA and based on the following formula:

$$\Omega = 1 - \left[ \frac{a - \sum h_i^2}{a + 2b} \right]$$

In this formula, "a" is the number of items of the factor, "h" is commonalities, and "b" is the total factor loading of the items of the factor. The McDonald's omega ranges from 0 to 1 (24).

### Stability

To examine stability, the final Persian version of the CSS completed by 15-20 qualified patients on two occasions at a two-week interval. Stability over time assessed using the test-retest method and the Intraclass correlation coefficient at a 0.05 confidence interval. An ICC above 0.75 is acceptable (25).

### Ethical considerations

The present study was approved by the Ethics Committee at Kurdistan University of Medical Sciences (no. IR.MUK.REC.1397.362). Before the study, the objectives were explained to the participants, and their informed consent was obtained. The participants were not asked to put their real names on the questionnaires, and they were reassured that their personal information remained completely confidential.

## RESULTS

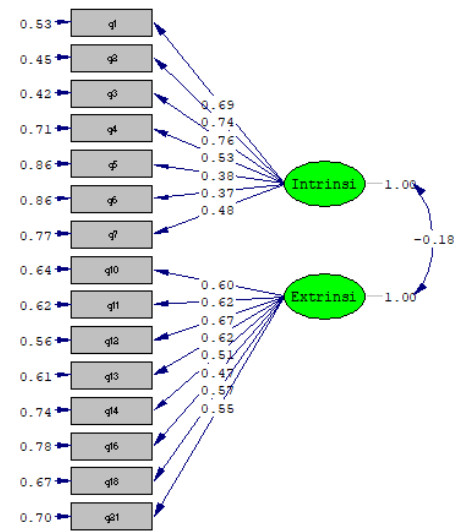
The sample included 341 patients with CVD with a mean age of  $46 \pm 6.4$ . The mean duration of suffering from CVD was  $8 \pm 3.8$  years. The demographic characteristics of the participants together with the mean and standard

deviation of the smoking cessation challenges score are presented in Table 1.

In an examination of the face and qualitative content validates several long sentences were shortened. Item analysis showed that items number 9, 15, 17, 19, and 20 had very low correlations with the total score; therefore they were not included in the analysis. The results of the analysis item are presented in Table 2.

Construct validity was assessed using EFA. The KMO test indicated sampling adequacy (KMO=0.913). Bartlett’s test of sphericity was statistically significant ( $X^2=1258.835$ ,  $df = 105$ ,  $p=0.001$ ). All factor loadings revealed in the EFA were above 0.30. In the CFA, two factors of Internal Challenges (Items number 1, 2, 3, 4, 5, 6, and 7) and External Challenges (Items 10, 11, 12 13, 14, 16, 18, and 21) with eigenvalues of 3.62 and 2.73 were extracted that together explained 42.619% of the variance of challenges to stopping smoking (Table 3).

The results of the Chi-squared test calculated using the CFA were as follows:  $X^2=196.07$ ,  $p=0.001$ . In addition, absolute, comparative, and parsimonious fit indices were assessed (Table 3) and all were found to be excellent: Root Mean Square Error of Approximation (RMSEA)=0.059; Comparative Fit Index (CFI)=0.94; Normed Fit Index (NFI): 0.90; Adjusted Goodness of Fit Index (AGFI)=0.90; Minimum Discrepancy Function by Degrees of Freedom divided (CMIN/DF) =2.2; Parsimonious Normed Fit Index (PNFI)=0.77 (Figure 1).



Chi-Square=196.07, df=89, P-value=0.00000, RMSEA=0.059

Figure 1. Final factor structure of the challenges to stopping smoking model

To examine reliability for the total scale and its subscales, Cronbach’s alpha and McDonald’s Omega coefficients were estimated. A Cronbach’s alpha of 0.68 and alphas of 0.74 and 0.79 were found for the total scale and Internal and external challenges, respectively. In addition, McDonald’s Omega coefficients of 0.65 and 0.64 were found for the internal and external challenges, respectively. Moreover, ICCs of 0.862 and 0.869 were found for internal and external challenges, respectively (Table 4).

Table 1. Demographic characteristics of the participants and the mean and standard deviation of the smoking cessation challenges score

Variable		N	%	Mean ±SD
Gender	Male	259	76	38.57±6.90
	Female	82	24	38.91±6.05
Occupation	Self-employed	262	76.8	38.77±6.30
	Government employee	79	23.2	38.26±7.91
Marital Status	Married	231	67.7	38.51±6.86
	Single	110	32.3	38.93±6.38
Education	Primary School	108	31.7	39.29±7.42
	Secondary School	54	15.8	38.33±6.15
	High School	96	28.2	38.41±6.20
Smoking	University education	83	24.3	38.30±6.67
	Current smoker	152	44.6	38.56±6.16
	ex-smokers	189	55.4	38.72±7.12

**Table 2.** Internal consistency of the challenges to stopping smoking

Item	Mean ± SD*	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. I experienced withdrawal symptoms (depression, anxiety, restlessness, irritability, insomnia, and getting the urge to smoke) while trying to quit smoking.	3.80±0.63	0.396	0.578
2. I felt lost without cigarettes.	3.64±0.75	0.436	0.562
3. I was addicted to cigarettes.	3.60±0.85	0.517	0.541
4. I felt angry and upset while trying to quit smoking.	3.43±0.89	0.382	0.569
5. I experienced a stressful event while trying to quit smoking.	3.01±1.09	0.336	0.577
6. I kept thinking that I would never be able to smoke again after quitting.	2.76±1.24	0.374	0.566
7. I felt bored while trying to quit smoking.	3.64±0.86	0.469	0.551
8. I saw people or things that reminded me of smoking.	2.49±1.18	0.170	0.627
9. I had easy access to cigarettes.	1.74±1.18	-0.049	0.696
10. It was difficult for me to find someone that could help me in quitting smoking.	1.99±1.10	0.45	0.624
11. The medical staff (physicians, nurses, and other care providers) did not provide me with enough support in quitting smoking.	1.88±1.10	0.455	0.622
12. I could not use smoking cessation aids, such as nicotine replacement therapies, because they cost a lot.	1.75±1.17	0.516	0.609
13. I did not use smoking cessation medicines, because I was afraid of their complications.	1.65±1.09	0.402	0.632
14. My family and friends did not encourage me to quit smoking.	2.02±1.16	0.390	0.633
15. I was afraid that I could gain weight after quitting smoking.	3.24±1.07	0.03	0.689
16. My family and friends encouraged me to smoke.	1.86±1.14	0.301	0.649
17. I was afraid that I could fail to quit smoking.	3.37±1.06	0.177	0.688
18. I did not use smoking cessation medicines, because I believed that they were not useful.	1.89±1.14	0.377	0.639
19. I was afraid that smoking cessation could disturb my social relationships.	3.16±1.14	0.065	0.689
20. I believed that I could quit smoking in the future if needed.	3.05±1.12	0.103	0.681
21. Quitting smoking was difficult for me because I used other drugs, like alcohol, cannabis, etc.	1.46±0.99	0.435	0.630

\*Mean of response to individual items on a four-point (1–4) scale, where 1=not a challenge and 4=major challenge.

**Table 3.** Exploratory factor analysis of the Persian version of the challenges to stopping smoking

Factor	Items	Factor Loading	Communalities	Eigenvalue	% of variance
Intrinsic Challenges	3. I was addicted to cigarettes.	0.777	0.619	3.662	24.414
	2. I felt lost without cigarettes.	0.762	0.596		
	1. I experienced withdrawal symptoms (depression, anxiety, restlessness, irritability, insomnia, and getting the urge to smoke) while trying to quit smoking.	0.710	0.504		
	4. I felt angry and upset while trying to quit smoking.	0.638	0.422		
	7. I felt bored while trying to quit smoking.	0.593	0.355		
	6. I kept thinking that I would never be able to smoke again after quitting.	0.515	0.273		
	5. I experienced a stressful event while trying to quit smoking.	0.502	0.252		
Extrinsic Challenges	12. I could not use smoking cessation aids, such as nicotine replacement therapies, because they cost a lot.	0.716	0.514	2.731	18.205
	10. It was difficult for me to find someone that could help me in quitting smoking.	0.673	0.453		
	11. The medical staff (physicians, nurses, and other care providers) did not provide me with enough support in quitting smoking.	0.671	0.455		
	13. I did not use smoking cessation medicines, because I was afraid of their complications.	0.665	0.453		
	21. Quitting smoking was difficult for me because I used other drugs, like alcohol, cannabis, etc.	0.637	0.415		
	18. I did not use smoking cessation medicines, because I believed that they were not useful.	0.623	0.402		
	14. My family and friends did not encourage me to quit smoking.	0.594	0.376		
16. My family and friends encouraged me to smoke.	0.558	0.313			

**Table 4.** Results of internal consistency and stability examination for the CSS

Challenges to stopping smoking	ICC (N=15)	95% Confidence Interval		P-Value	Cronbach's $\alpha$	McDonald Omega
		Lower limit	Upper limit			
Intrinsic Challenges	86.2	73.3	94.6	0.001	0.740	0.65
Extrinsic Challenges	86.9	74.8	97.8	0.001	0.799	0.647

## DISCUSSION

The present study was aimed at translating the Challenges to Stopping Smoking Scale (CSS) into Persian and examining its psychometric properties in patients with CVD. The results showed that the CSS had two factors including Internal Challenges (withdrawal symptoms, feeling lost, nicotine addiction, anger, stressful life events) and External Challenges (lack of support for family and medical staff, peer pressure for smoking, high cost of nicotine replacement therapies, disturbed social relationships) that together explained 42.619% of the total variance. The Internal Challenges dimension (24.414%) explained a slightly larger part of the total variance compared to the External Challenges dimension (18.205%); this indicated the more important role of internal challenges in stopping smoking. The original version of the CSS also has two dimensions of internal and external challenges that together explained 50.7% of the total variance (10).

The highest factor loading in the internal challenges dimension was for item number 3 (I was addicted to cigarettes), and the highest factor loading in the external challenges dimension was for item number 12 (I could not use smoking cessation aids like nicotine replacement therapy because they cost a lot). The Barriers to Cessation Scale (BCS) developed by Macnee and Talsma (1995) has 19 items and 3 dimensions of addiction, internal challenges, and external challenges (27). This old scale may not properly reflect the current challenges of smoking cessation such as cigarette accessibility and access to nicotine replacement medications, because recent decades have seen a great change in challenges to smoking cessation. In a cross-sectional study, Nurulfarahin et al. tried to identify challenges to smoking cessation among 228 smokers in Malaysia. They used the CSS-21 (adapted

from the CSS) consisted of three dimensions of addiction, internal challenges, and external challenges to collect data (28). This classification seems to be influenced by the BCS. Not reporting the process of adapting the scale and the psychometric properties of the adapted version limits the usability of the scale. In addition, addiction still seems to be a part of the internal challenges dimension despite being considered a separate dimension.

Gulick and Escobar-Florez designed the Smoking and Women Questionnaire (SWQ) to assess the readiness to stop smoking in women. The SWQ has 14 items and 8 core elements including beliefs/attitudes toward smoking, sociability, stress, coping, self-efficacy, motivation, nicotine dependence, and support. The core elements have been developed by combining theoretical knowledge and empirical evidence. The items are rated on a Likert-type scale ranging from 1 (totally disagree) to 6 (totally agree), and higher scores indicate a better attitude toward smoking cessation (29). Given that the SWQ has been designed for women from three specific ethnicities, it has limitations in assessing men and different ethnicities. The items of the CSS properly cover those of the SWQ. For example, similar to the support dimension of the SWQ, items number 10, 11, and 14 of the CSS assess support from special people including medical staff, family, and friends, and items number 1 and 3 on the CSS assess the nicotine dependence dimension of the SWQ. In addition, three items of the CSS assess nicotine replacement medicines that are not assessed by older scales. Haddad and Hoeman translated and validated the SWQ in Jordan, and introduced it under the title of Arabic Readiness to Stop Smoking Questionnaire (A-RSSQ). Their sample included 260 Jordanian men and women. In the original version of the SWQ and its Arabic version, EFA results were not reported, and only discriminant validity was reported



which showed that smokers had lower scores on attitude on smoking cessation than non-smokers (30).

In the CSS, higher scores indicate more challenges. The highest challenge scores (3.8, 3.64, and 3.64) are for items number 1 (I experienced withdrawal symptoms while trying to quit smoking.), 2 (I felt lost without cigarettes), and 7 (I felt bored while trying to quit smoking), respectively. They were all among the items assessing internal challenges to smoking cessation. The lowest scores (1.46 and 1.65) were for items number 21 (Quitting smoking was difficult for me, because I used other drugs, like alcohol, cannabis, etc.) and 13 (I did not use smoking cessation medicines, because I was afraid of their complications), respectively. These two items were put in the external challenges dimension.

Internal consistencies of 0.862 and 0.869 were found for the internal and external challenges to smoking cessation, respectively. The original authors reported internal consistencies of 0.86 and 0.82 for the internal and external challenges, respectively (10). In addition, the stability and internal consistency of the SWB have been reported as 0.84 and 0.83, respectively (29), and those of its Arabic version found to be 0.77 and 0.74, respectively (30). The reliability estimates found for the Persian of the CSS and the Arabic version of the SWQ are in the acceptable range, but lower than those of their original versions.

## CONCLUSION

The Persian version of the Challenges to Stopping Smoking (CSS) scale has a good validity and reliability and can be used in future studies. Given that many concepts change over time; it is important to measure those using updated instruments. The CSS as a new instrument not only covers challenges to smoking cessation assessed by older instruments, but also assesses new challenges including nicotine replacement medicines.

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