

Psychometric Properties of the Iranian Brief Version of the Transtheoretical Model Instrument in Terms of Hookah Tobacco Smoking Cessation

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Original Article

Abstract

Background: Transtheoretical model (TTM) has been recognized as a common theoretical model in researches in terms of addictive behaviors. The aim of this study was to examine the psychometric properties of the Persian brief version of the TTM for hookah tobacco smoking cessation in a sample of Iranian rural adults who were in the preparation stage for hookah cessation.

Methods: This was a validation study on Iranian rural adult hookah smokers by the TTM instrument. First, to translate the questionnaire items from English to Persian, backward-forward procedure was used. Face and content validity of the instrument items were assessed. Confirmatory factor analysis (CFA) was performed to determine the construct validity of the instrument. For this aim, 300 participants completed the instrument. Cronbach's alpha coefficient and intraclass correlation coefficient (ICC) were calculated to examine the internal consistency and reliability of the subscales of the instrument.

Findings: The content validity index (CVI) and content validity ratio (CVR) of the items were ≥ 0.80 and ≥ 0.60 , respectively. Based on CFA, the data fitted the TTM model. root mean square error of approximation (RMSEA), the goodness of fit index (GFI), adjusted GFI, and comparative fit index (CFI) were 0.037, 0.960, 0.910, and 0.950, respectively. At this stage, 6 items were deleted. The ICC and Cronbach's alpha of the subscales ranged between 0.60-0.74 and 0.71-0.86, respectively. The final instrument with 29 items was confirmed.

Conclusion: The findings suggest that translating Persian brief version of the TTM instrument was a reliable and valid tool to identify the determinants of hookah smoking cessation among Iranian rural adults.

Keywords: Hookah smoking; Transtheoretical model; Scale; Psychometrics; Iran

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Introduction

Hookah tobacco smoking is an emerging threat for public health across the world.¹ This smoking is an old practice prevalent in the cultural tradition of Eastern Mediterranean countries, the Middle East, and some parts of Asia.² In the past two decades, this type of tobacco smoking has been also spread in other parts of the world including Europe and North America especially among adolescents and young adults.³ The harmful health effects of hookah smoking have been well documented. Its use may increase cardiac and respiratory illness, cancers such as lung, gastric, and esophageal, periodontal disease, and other acute and chronic health problems among the consumers.⁴ Despite the dangers of hookah tobacco smoking, globally, about 100 million people use it daily.⁵

Current literature shows that the use of hookah is one of the common methods of tobacco smoking in many areas of Iran⁶ such as south regions and villages.⁷⁻⁹ For example, a study by Ghafouri et al. showed that 51% of Iranian university students were current hookah smokers.¹⁰ The number of Iranians who use hookah and cigarette together is also considerable.¹¹ A variety of factors such as family member smoking, stress level, gender,¹² occupation status, housewife/jobless status, going frequently to restaurants,¹³ social norms, smoking friends,¹⁴ need for amusement and recreation, attracting attention, satisfying and joining others,¹⁵ socializing and relaxation,¹⁶ lack of knowledge, smoking refusal skill, and self-efficacy,⁶ and ease of access⁸ which contribute to the initiation and continuation of hookah tobacco smoking in Iranian population have been identified. However, additional information regarding the theoretical variables that positively or negatively influence hookah tobacco smoking is required to develop tailored and effective efforts aimed at preventing or decreasing hookah smoking.¹⁷

Behavior change theories as conceptual frameworks attempt to explain the behavior determinants for developing effective interventions.¹⁸ The theories explain why behavior changes and people do or do not involve in a special behavior.^{19,20} Transtheoretical model (TTM), as one of the most known theoretical models, has been widely used to develop behavior change interventions in

different issues,²¹ especially addictive behaviors such as quitting smoking, alcohol consumption, and substance abuse.²² TTM variables was introduced by Prochaska et al.²³ The model had 4 main variables including five stages of change, ten processes of change, self-efficacy/temptation, and decisional balance.^{23,24} In fact, providing a tool to reliably assess the variables is imperative. For this aim, Fava et al. developed an instrument based on TTM variables in terms of smoking cessation.²⁵ To use the instrument in a different culture, it was needed to be adapted.²⁶ Although the TTM questionnaire has been validated in English, the literature on the subject is limited in Iran.²⁷

A health instrument can be used properly in different cultures to identify that whether there is essential linguistic, ethnic, psychological, and cultural adaptation and all linguistic, ethnic, cognitive, and cultural barriers are eliminated. In this regard, it is necessary to examine the validity and reliability of such an instrument in any culture like Iran. Therefore, given the prevalence of hookah tobacco smoking in Iran⁷⁻⁹ and the necessity of developing validated instruments for assessing predictors of the behavior due to developing tailored education interventions, the present study was done. This study was conducted to assess the psychometric properties of the Persian brief version of the TTM for hookah tobacco smoking cessation in a sample of Iranian rural adults who were in the preparation stage of hookah cessation.

Methods

Study design: This psychometric study was conducted from November 2016 to April 2017 in two villages of Shiraz, Iran. The protocol of the study was approved by the Ethics Committee of Iran University of Medical Sciences (with the code of IR.IUMS.REC.94-05-27-27359). An informed written consent was obtained from each participant. Also, researchers explained about the aims of the present study and confidentiality of the data to the participants.

The original TTM instrument in terms of smoking cessation: The TTM instrument was originally developed by Prochaska et al.²³ in two long (83 items) and brief versions (38 items) in order to identify the smoking cessation determinants. The instrument had 38 items with

four factors including stages of change (with 3 items), processes of change (with 20 items), situational self-efficacy (with 9 items), and decisional balance (with 6 items). The items are scored using a five-point Likert-type scale.²⁸ In the present study, we attempted to determine the suitability of the brief form of the instrument in terms of hookah tobacco smoking cessation in a sample of Iranian rural adults who were currently in the preparation stage of hookah cessation. Therefore, we deleted the stage of change variables (with 3 items) in the validation process of the instrument.

Adapting TTM instrument in terms of hookah smoking cessation: We adapted the instrument in the following three steps:

A) First step: translation of the instrument from English to Persian

Some translators who were proficient in both Persian and English used the forward-backward procedure to translate the TTM instrument. In the forward translation step, the instrument items were translated into Persian by two independent expert translators. Next, the two Persian versions of the instrument were compared and the translators made a temporary version of it. Likewise, in the backward step, two translators competent in English translated the temporary Persian version of the instrument back into English. Upon their translation, a temporary English version was prepared.

B) Second step: assessing the validity of the instrument by three methods of face validity, content validity, and construct validity

At first, to estimate the face validity of the instrument, a group of 20 hookah smokers were asked to tell on the clarity, simplicity, and readability of the instrument items in face-to-face interview sessions. Following the interviews, some vague items were revised and the language of some items was improved.

For measuring the content validity, the expert panel (including 15 experts in health education and addiction) was asked to judge the necessity, relevance, wording, and grammar of each item. Based on their opinions, content validity ratio (CVR) and content validity index (CVI) of the items were calculated. Items with a CVR score of 0.49 and more²⁹ and a CVI score of 0.80 and above³⁰ were considered as satisfactory. Then, the construct validity of the instrument was assessed

by confirmatory factor analysis (CFA). To measure CFA, 300 hookah consumers who had permanently lived in two villages of Shiraz City were randomly selected. They completed the questionnaire. Selection criteria were as follows: 1. not having the illnesses related to tobacco smoking such as lung cancer, coronary heart disease (CHD), and so on; 2. 20 to 65 years of age; 3. being in the preparation stage of TTM stages of change (in other words, having a plan on quitting hookah tobacco smoking in the next 30 days); 4. being current hookah tobacco smoker at least once a week; 5. not being involved in any other quitting attempt; and 6. having Iranian citizenship and the ability to read and write in Persian.

To assess the adequacy of model fit, multiple indexes are usually used.³¹ In the present study, to estimate the fitness of the instrument, several indexes such as the relative chi square test, the goodness of fit index (GFI), adjusted GFI (AGFI), comparative fit index (CFI), and the root mean square error of approximation (RMSEA) were used. Each of the indexes defines a particular acceptability range. For example, GFI and AGFI values vary between 0 and 1. For this index, values greater than 0.90 show goodness of fit of the model. CFI index considers values close to 1 as appropriate and those greater than 0.90 shows the good fit of the model. Regarding RMSEA, values lower than 0.05 show a good fit while those above 0.08 and 0.10 represent moderate and poor fitness of the model, respectively.³¹⁻³³

C) Third step: measuring internal consistency and reliability of the subscales of the instrument

The internal consistency of three subscales of the instrument was measured ($n = 30$). Also, to calculate the stability of the scale intraclass correlation coefficient (ICC), 25 hookah tobacco smokers completed the instrument twice with a 2-week interval. Cronbach's alpha of 0.70 and above³⁴ and ICC of 0.40 and above³⁵ were considered as satisfactory.

Statistical analyses such as mean and standard deviation (SD) were calculated by the SPSS software (version 23, IBM Corporation, Armonk, NY, USA) and CFA was done by the AMOS software (version 22, IBM SPSS AMOS, Chicago, USA).

Results

Face validity: Based on the participants'

comments, ambiguous and difficult items were revised. Also, four wording errors were edited.

Quantitative content validity: CVI and CVR of all items were above 0.80 and 0.60, respectively (Table 1). In this stage, no items were omitted.

CFA: The average age of the subjects in the CFA was 38.36 years (SD = 11.84). 42.2% of them were men. The mean frequency of hookah tobacco consumption was 7.86 (SD = 8.48) times per week (ranging from 1 to 50 times) among the participants. The average years of hookah smoking and the initiation age of the hookah tobacco smoking were 10.35 (SD = 8.69) and 26.03

(SD = 8.77) years, respectively.

The results showed that at first step, the measurement model did not fit the data. Overall, 6 items (items A3, A4, and A15 of the processes of change subscale, items A21 and A26 of the situational self-efficacy subscale, and item A35 of the decisional balance subscale) had loading factors of < 0.4. Therefore, they were omitted from the instrument. Moreover, some correlations between the variables' errors of the same factor were added to the model based on the modification indices. After the modifications, the model fitted the data strongly (Figure 1).

Table 1. Content validity index (CVI) and content validity ratio (CVR) for transtheoretical model (TTM) subscales in terms of hookah tobacco smoking cessation

Items	CVI	CVR
A1 I recall information that people have given me on the benefits of quitting hookah smoking.	0.86	0.73
A2 I think of the information from articles and ads about how to stop hookah smoking.	0.80	0.86
A3 Warnings about the health hazards of hookah smoking move me emotionally.	0.80	0.73
A4 I react emotionally to warnings about hookah smoking.	0.80	0.73
A5 I stop to think that hookah smoking pollutes the environment.	0.80	0.60
A6 I consider that hookah smoking can be harmful to the environment.	0.86	0.73
A7 I get upset when I think about my hookah smoking.	0.80	0.86
A8 My need for hookah smoking makes me disappointed in myself.	0.80	0.73
A9 I notice that non-hookah smokers are asserting their rights.	0.80	0.60
A10 I find society changing in ways that makes it easier for non-hookah smokers.	0.80	0.73
A11 I can expect to be rewarded by others if I do not smoke hookah.	0.93	0.86
A12 I am rewarded by others if I do not smoke hookah.	0.86	0.86
A13 When I am tempted to hookah, I think about something else.	0.93	0.86
A14 I do something else instead of hookah smoking when I need to relax.	0.93	0.86
A15 I have someone who listens when I need to talk about my hookah smoking.	0.93	0.86
A16 I have someone I can count on when I am having problems with hookah smoking.	0.93	0.86
A17 I tell myself I can quit if I want to.	0.93	0.86
A18 I tell myself that if I try hard enough, I can quite hookah smoking.	0.86	0.86
A19 I remove stuff in my home or workplace that remind me of hookah smoking.	0.93	0.86
A20 I keep things around my home or workplace that remind me not to smoke hookah.	0.93	0.86
How confident are you that you would not smoke in each situation during the past week? (A21-A29)		
A21 With friends at a party?	0.93	0.86
A22 Over tea/coffee while talking and relaxing?	0.86	0.73
A23 With my spouse or close friend who is a hookah smoker?	0.86	0.60
A24 When I first get up in the morning?	0.86	0.73
A25 When I feel I need a lift?	0.93	0.86
A26 When I realize I have not smoked hookah for a while?	0.86	0.86
A27 When I am very anxious and stressed?	0.93	0.73
A28 When I am very angry about something or someone?	0.93	0.73
A29 When things are not going my way and I am frustrated?	0.86	0.86
A30 Hookah smoking relieves tension.	0.93	0.86
A31 Hookah smoking helps me concentrate and do better work.	0.93	0.86
A32 I am relaxed and therefore more pleased when smoking hookah.	0.93	0.86
A33 I am embarrassed to have to smoke hookah.	0.93	0.73
A34 My hookah smoking bothers other people.	0.93	0.73
A35 People think I am foolish for ignoring the warnings about hookah smoking	0.93	0.86

CVI: Content validity index; CVR: Content validity ratio

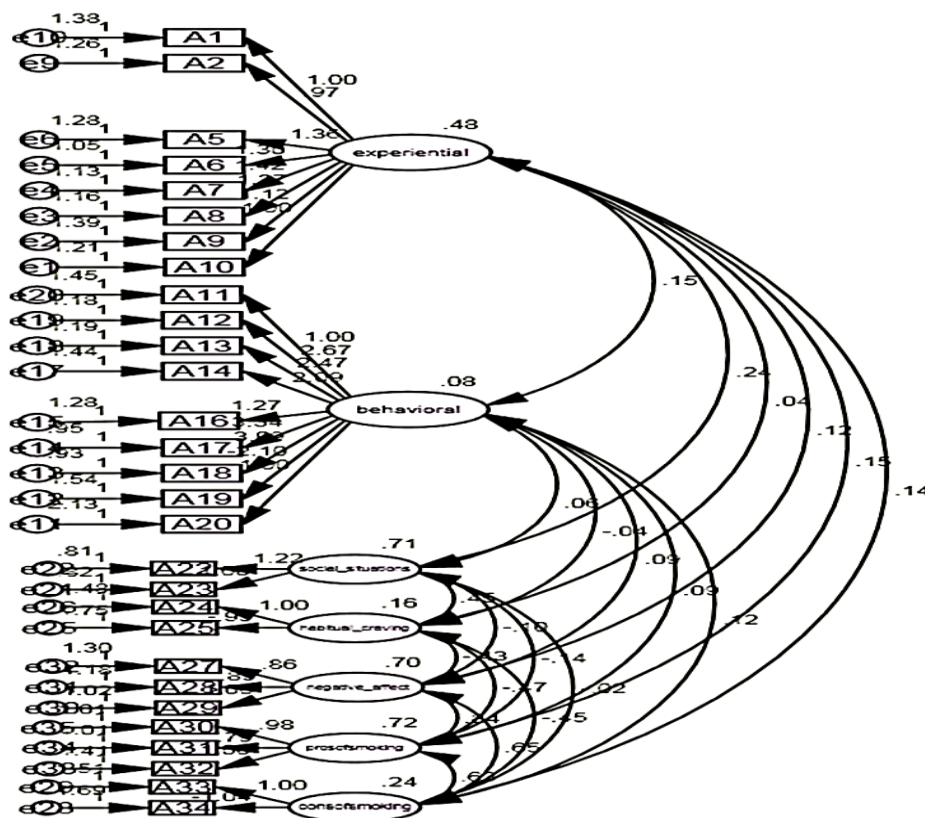


Figure 1. The final pattern of 29-item instrument following confirmatory factor analysis (CFA) of 300 hookah consumers. Data fitted the transtheoretical model (TTM) and its subscales. Standardized coefficients were illustrated on the arrows

The following fit indices were found after that model fitted: GFI was equal to 0.96; AGFI was equal to 0.91; the CFI was equal to 0.95; the RMSEA was equal to 0.037; and the relative chi-square [$\chi^2/\text{degree of freedom (df)}$] was equal to 3.82 ($P < 0.0001$) (Table 2). Also, table 3 represents the estimated coefficients. All the estimated coefficients were statistically significant ($P < 0.0001$) and more than 0.40 (Table 3).

Reliability: Cronbach's alpha coefficient of all subscales was acceptable. In addition, ICC of the subscales of the instrument had a good internal consistency and stability. In table 4, ICC and Cronbach's alpha coefficient of subscales are presented.

Discussion

In the current study, psychometric properties of the Persian brief version of the TTM instrument for hookah tobacco smoking cessation with three variables including self-efficacy, processes of change, and decisional balance among a sample of Iranian rural adults were assessed. In fact, psychometric testing of the TTM instrument in terms of smoking cigarette cessation^{27,36} has been measured and affirmed in few studies. The results demonstrated that the instrument was a valid and reliable tool to detect determinants of hookah tobacco smoking cessation among a sample of Iranian rural adults.

Table 2. Model fit indices in confirmatory factor analysis (CFA) of total transtheoretical model (TTM) before and after applying modifications in a pilot study on Iranian hookah smokers (n = 300)

Variable	Modification	GFI	AGFI	CFI	RMSEA	χ^2/df	P
Total TTM	Before	0.720	0.680	0.580	0.096	3.740	< 0.0001
	After	0.960	0.910	0.950	0.037	3.820	< 0.0001

GFI: Goodness of fit index; AGFI, Adjusted goodness of fit index; CFI, Comparative fit index; RMSEA: Root mean square error of approximation; TTM: transtheoretical model; df: Degree of freedom

Table 3. Estimated coefficients of the final confirmatory factor analysis (CFA) model on data from a pilot study on Iranian hookah smokers (n = 300)*

Variables	Items	Unstandardized estimate	Standard error	Standardized estimate
Experiential process	A10	1.000	-	0.531
Experiential process	A9	1.117	0.136	0.548
Experiential process	A8	1.372	0.143	0.661
Experiential process	A7	1.416	0.145	0.676
Experiential process	A6	1.296	0.136	0.658
Experiential process	A5	1.358	0.146	0.638
Experiential process	A2	0.968	0.126	0.512
Experiential process	A1	1.000	-	0.507
Behavioral process	A20	1.000	-	0.491
Behavioral process	A19	-2.097	0.522	-0.433
Behavioral process	A18	3.088	0.686	0.673
Behavioral process	A17	3.341	0.738	0.696
Behavioral process	A16	1.274	0.370	0.404
Behavioral process	A14	2.088	0.516	0.443
Behavioral process	A13	2.474	0.575	0.542
Behavioral process	A12	2.667	0.612	0.572
Behavioral process	A11	1.000	-	0.430
Social situations	A23	1.000	-	0.681
Social situations	A22	1.218	0.145	0.753
Habitual craving	A25	-0.955	0.157	-0.475
Habitual craving	A24	1.000	-	0.410
Cons of hookah smoking	A34	-1.038	0.149	-0.465
Cons of hookah smoking	A33	1.000	-	0.470
Negative effect	A29	1.000	-	0.637
Negative effect	A28	0.890	0.100	0.564
Negative effect	A27	0.859	0.102	0.532
Pros of hookah smoking	A32	1.000	-	0.581
Pros of hookah smoking	A31	0.786	0.097	0.554
Pros of hookah smoking	A30	0.978	0.108	0.638

*All estimated coefficients for latent constructs were significant (P < 0.0001)

Evaluating validity of these instruments may help health practitioners in developing and finally evaluating culture-based education efforts in the field of hookah tobacco smoking cessation.

In this study, after translating the instrument from English into Persian, qualitative face validity of the items was assessed by a group of 20 individuals who had inclusion criteria.

Table 4. Cronbach's alpha (n = 30) and intraclass correlation coefficient (ICC) (n = 25) for transtheoretical model (TTM) subscales in terms of hookah tobacco smoking cessation

Subscale	Number of items	Cronbach's alpha	ICC
Processes of change	20	0.86	0.74
Behavioral processes	10	0.79	0.60
Experiential processes	10	0.76	0.74
Situational self-efficacy	9	0.80	0.69
Social situations	3	0.71	0.60
Habitual/craving	3	0.71	0.71
Negative effect situations	3	0.74	0.66
Decisional balance	6	0.71	0.71
Pros of hookah smoking	3	0.71	0.71
Cons of hookah smoking	3	0.75	0.67
Total	35	0.83	0.70

ICC: Intraclass correlation coefficient

The majority of items were meaningful to the individuals. There were minor difficulties in responding to such items. The items were edited. Finally, understandability of all items of the instrument was confirmed by the participants. This finding is in line with other similar studies.^{27,36,37} For example, Sarbandi et al. measured face validity of the TTM instrument by 20 male cigarette smokers to ensure that they understood the meaning of each item.²⁷ Given that face validity identifies the degree to which a test and its items seem valid and meaningful to the individuals taking the test,³⁸ performing it for psychometric evaluation of each instrument is essential.

In the present study, for assessing qualitative content validity, the authors used a panel of experts' opinions (in health education and addiction). Then, CVI and CVR of each item of the instrument according to experts' responses were measured. McGartland Rubio et al. stated that the experts' suggestions were one of the best methods for assessing content validity of items of an instrument.³⁹ In our study, CVI and CVR scores of all instrument items were satisfactory (≥ 0.80 and ≥ 0.60 , respectively). In many studies, quantitative content validity of the developed instrument items has been measured.^{40,41} For example, Dehdari et al. measured CVI and CVR scores of items of a questionnaire on Pender's health promotion model (HPM) variables to determine the potential predictors of breakfast consumption among female students. The result of the study showed that CVI and CVR of the items were satisfactory.⁴¹ Hassani et al. also assessed CVI and CVR of items of a developed instrument based on protection motivation theory variables to measure the factors influencing women's intention for first Pap test practice. Those items with a CVR score of 0.62 and more and CVI score of 0.80 and above were selected and remained in the instrument.⁴⁰ As a whole, the expert panel confirmed the content validity of the items of the Iranian brief version of the TTM instrument in terms of hookah tobacco smoking cessation.

CFA was done in order to ascertain if the coherence between the data and the theoretical structure existed. The 35-item instrument was examined for CFA. The result of the present study did not exactly support the construct validity of the original instrument. Since a remarkable problem on fit indices was observed, some

modifications were made. Six items (3 items of the change of processes, 2 items of the situational self-efficacy, and 1 item of the decision-balance subscales) which had loading factors of < 0.40 were omitted in this stage. The model was accepted in the modified form (Figure 1). CFA also showed that comparative indices of the modified model, including GFI, AGFI, CFI, RMSEA, and the relative chi-square (χ^2/df) were equal to 0.960, 0.910, 0.950, 0.037, and 3.820 ($P < 0.0001$), respectively, which indicated an acceptable fit for the data. This result is in agreement with Mahmoudi et al.⁴² and Hassani et al.⁴⁰ studies.

In the present study, it was observed that all instrument subscales had acceptable internal consistency and stability. Cronbach's alpha for the subscales of the instrument was satisfactory. In line with Mahmoudi et al.⁴² and Sarbandi et al.²⁷ studies, Cronbach's alpha of the TTM subscales in terms of hookah tobacco smoking cessation ranged from 0.71 to 0.86. In this study, ICC of the subscales ranged from 0.60-0.74. Linton et al. indicated that according to Hazard Munro⁴³ comment "when investigating the relationship among different aspects of human behavior" a correlation coefficient of equal or greater than 0.50 is an acceptable value.⁴⁴

Although the current study may provide a valid instrument for measuring the determinants of hookah smoking cessation based on TTM variables among a sample of Iranian rural adults, it faced two limitations. First, the study samples were adults who resided in the rural areas of Shiraz City and had a limited education. This homogeneity of samples may limit the extent to which findings can be generalized to other people in other areas of Iran. More efforts to validate the scale with other groups are suggested.

Second, we recruited hookah smokers who were in the preparation stage (of change stage of TTM) and thus the reliability and validity of the measure cannot show differences among smokers in other stages. A survey of psychometric properties of the instrument for individuals in other phases of the change stage of TTM (including pre-contemplation, contemplation, action, maintenance, and relapse phases) is suggested.

Conclusion

The results showed that modified TTM (with 29

items in the three subscales including situational self-efficacy, decisional balance, and processes of change) was a valid tool to identify the determinants of hookah tobacco smoking cessation among Iranian rural adults who were in the preparation stage of cessation, and finally it can be applied in developing theory-based health interventions in this field.

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Conflict of Interests

The Authors have no conflict of interest.

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ویژگی‌های روان‌سنجی نسخه کوتاه فارسی پرسش‌نامه مدل فرانظری در رابطه با ترک مصرف قلیان

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مقاله پژوهشی

چکیده

مقدمه: یکی از الگوهای نظری رایج در مطالعه رفتارهای اعتیادآور، الگوی فرانظری است. هدف از انجام پژوهش حاضر، بررسی ویژگی‌های روان‌سنجی نسخه کوتاه فارسی سازه‌های الگوی فرانظری در ترک مصرف قلیان بر روی نمونه‌ای از بزرگسالان روستایی ایرانی بود که در مرحله آماده‌سازی جهت ترک قرار داشتند.

روش‌ها: این مطالعه اعتبارسنجی مقطعی، در بین بزرگسالان روستایی ایرانی مصرف‌کننده قلیان با استفاده از ابزار سنجش سازه‌های الگوی فرانظری انجام شد. ابتدا برای ترجمه آیتم‌های پرسش‌نامه از انگلیسی به فارسی، از روش ترجمه پیش‌رو-پس‌رو استفاده شد. سپس روایی صوری و محتوای کیفی آیتم‌ها و تحلیل عاملی تأییدی جهت تعیین اعتبار سازه ابزار مورد ارزیابی قرار گرفت. بدین منظور، ۳۰۰ شرکت‌کننده به سؤالات پرسش‌نامه پاسخ دادند. ضریب Cronbach's alpha و ضریب همبستگی درون رده‌ای (Intraclass correlation coefficient یا ICC) برای بررسی سازگاری داخلی و اعتبار زیرمقیاس‌های ابزار محاسبه گردید.

یافته‌ها: شاخص روایی محتوا و نسبت روایی محتوای آیتم‌های مقیاس به ترتیب $80 \geq$ و $0/60 \geq$ به دست آمد. بر اساس نتایج تحلیل عاملی تأییدی، داده‌ها الگوی فرانظری را تأیید کردند. ریشه میانگین مربع خطای برآورد، شاخص نیکویی برازش، شاخص نیکویی برازش اصلاح شده و شاخص برازش تطبیقی به ترتیب $0/37$ ، $0/96$ ، $0/91$ و $0/95$ بود. در این مرحله، شش آیتم حذف شد. دامنه زیرمقیاس‌های Cronbach's alpha و ICC به ترتیب $0/71-0/86$ و $0/60-0/74$ به دست آمد و ابزار نهایی با ۲۹ آیتم مورد تأیید قرار گرفت.

نتیجه‌گیری: ترجمه نسخه کوتاه فارسی ابزار سنجش سازه‌های الگوی فرانظری، مقیاس معتبر و قابل اعتمادی جهت شناسایی عوامل مؤثر بر ترک مصرف قلیان در میان بزرگسالان روستایی ایرانی می‌باشد.

واژگان کلیدی: مصرف قلیان، الگوی فرانظری، ابزار، روان‌سنجی، ایران

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