

## Development, Validation, and Cross Cultural Adoption of Persian Version of Behavioral Risk Factor Tool

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Received: 5 Aug 2023

Published: 27 Feb 2024

### Abstract

**Background:** One of the most crucial objectives of policymakers is to enhance the population's overall health. Establishing a surveillance system is a way to achieve this goal. The Behavioral Risk Factor Surveillance System (BRFSS) is a national system that collects data on the health-related behaviors of the United States residents using the Behavioral Risk Factor Questionnaire (BRFSSQ). This survey is aimed at reducing risk behaviors and their consequences. Regarding the fact that the cultural environment within each country may affect how behaviors are assessed, this study aimed to develop a Persian version, cross-cultural adaptation, and assess the validity and reliability of the PBRFSSQ.

**Methods:** In this cross-sectional study, 250 individuals were enrolled using the stratified sampling method between August 2022 and April 2023. Six steps of translation and test method proposed by Sousa et al was used. Content and face validity were calculated. Also, the Cronbach's alpha and test-retest were computed.

**Results:** Of all participants, 54.5% were male and aged 30 to 65 years old (69%). The Scale Content Validity Index was equal to 0.95. The Intra class Correlation Coefficient (ICC) was computed as 0.86, 0.88, and 0.87 for the core, optional, and total components, respectively. Furthermore, the Cronbach's alpha coefficient of 0.85 was obtained overall.

**Conclusion:** This tool was highly valid and reliable for assessing risky behaviors among the Iranian general population.

**Keywords:** Validity, Reliability, Behavior, Psychometrics, Risk factor

**Conflicts of Interest:** None declared

**Funding:** This study was based on data from Elham Davtalab Esmaeili's PhD thesis, which the Research Deputy of the TUMS financially supported under Grant No. 69209.

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**Cite this article as:** Davtalab Esmaeili E, R. Kalankesh L, Zeinalzadeh AH, Ghaffari A, Dastgiri S. Development, Validation, and Cross Cultural Adoption of Persian Version of Behavioral Risk Factor Tool. *Med J Islam Repub Iran*. 2024 (27 Feb);38:21. <https://doi.org/10.47176/mjiri.38.21>

### Introduction

One of the most crucial objectives of policymakers is to enhance the overall health of the population and decrease health disparities based on geography and socioeconomic status (1). Therefore, it is necessary to assess the health status of individuals and develop strategies to enhance it. Although measuring health status can be challenging, it is possible to determine unhealthy status and identify its predictors (2, 3). One way to achieve this goal is by establishing a surveillance system. The outcome-oriented surveillance

system focuses on various outcomes associated with health-related events or their immediate anticipation (4). Along with epidemiologic and demographic transitions, non-communicable diseases, as well as emerging and reemerging communicable diseases, have increased (5). Several scientific studies have demonstrated that various personal behaviors are strongly related to premature mortality and morbidity. Today, most behaviors are regarded as predictors of diseases (6-8).

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#### ↑What is "already known" in this topic:

There is a huge gap between knowledge, policy, and health implementation. However, there is no valid and comprehensive behavioral risk factor questionnaire for assessing health-related behaviors and chronic health conditions in Iran.

#### →What this article adds:

The emerged valid Persian version of the Behavioral Risk Factor Surveillance System Questionnaire (BRFSSQ) tool in the current study could be used to assess high-risk behavior in the Iranian context. Furthermore, this tool provides a framework for the implementation of health practice in the national disease surveillance system and health issues.

The Behavioral Risk Factor Surveillance System (BRFSS) is a national system of health-related surveys that collect data on the health-related behaviors and chronic health conditions of the United States residents (9). Later, various countries requested technical assistance from the CDC in establishing similar surveillance systems (10). The significant advantage of the BRFSS is bridging the gap between knowledge, policy, and health implementation (11). The BRFSS Questionnaire (BRFSSQ) is used in the BRFSS and was developed by the Centers for Disease Control and Prevention (CDC) staff (12).

The cultural environment and ethical norms within each country may affect how behaviors are assessed. To the best of the authors' knowledge, no research on the cross-cultural adoption of this tool in Persian was found. The Persian version of the BRFSSQ (PBRFSSQ) can be considered an efficient tool for developing knowledge on population health surveillance, and it can be used to compare health across nations. Hence, this study aimed to a Persian version, cross-cultural adaptation, and psychometric evaluation of the PBRFSSQ.

## Methods

### Study Design and Sampling

The present cross-sectional study was conducted to develop the PBRFSSQ and assess its psychometric properties in the Iranian population. A sample of the general population of Tabriz, Iran, was enrolled between August 2022 and April 2023. The participants were chosen using the proportional stratified sampling method.

The sample size was 60 to determine the value of 0.4 for the Intra-class Correlation Coefficient (ICC) with a defined power of <90%, an alpha of 0.05, and a drop-off rate of 20% (13).

The response rate was found to be 95%. To assess internal consistency and face validity, 190 and 15 participants were considered, respectively. Moreover, 10 participants were used to pilot the tool. People with Iranian nationality aged 14 to 90 were included in this study.

### The Original Version of the BRFSSQ

The BRFSSQ 2020 is a standardized tool consisting of 2 parts: a Core Component (CC) and an Optional Module (OM). The CC includes the 97 items that are grouped into the 18 subscales. OM consists of 89 items, which are categorized into 23 subscales.

The questions included a variety of Likert scales, ranging from 2 to 8. The BRFSSQ is in the public domain and can be accessed through the CDC website (12).

### Development, Cross-Cultural Adoption, Validity, and Reliability of the PBRFSSQ

The present study was conducted based on translation and test method proposed by Sousa et al (Figure 1) (14). First, 2 bilingual translators independently translated the tool into Persian.

To fill in the gaps, translated versions were compared and combined in the following phase. In the event of significant differences, a third translator would make the decision. In the third step, 2 native English translators retranslated the

preliminary version into English.

In step 4, the back-translated versions were compared with the original version. A focus group discussion (FGD) was held in the fifth step. This committee consisted of 13 experts. The experts included 2 epidemiologists, 1 psychologist, 1 psychiatrist, 1 medical geneticist, 1 general practitioner, 1 nurse, 4 health care providers, 1 emergency physician, and 1 health economist.

In this step, items that required changes in the region's cultural and common health issues were modified using expert opinions and literature reviews.

Items regarding sexual orientation were culturally modified. The item related to the use of marijuana for medical purposes has been removed as such use is not legal in Iran. Regarding the low prevalence of self-reported asthma and hepatitis C in Iran, items related to these have been removed (15, 16).

A question about water pipe smoking (WPS) was added regarding the high prevalence of WPS. Furthermore, 2 items about E-Cigarettes were removed because they were not prevalent in Iran (17).

Questions about the oral detection of Human Immunodeficiency Virus (HIV) have been modified due to their low usage in Iran. Since the pneumonia, Gardasil, and shingles vaccines are not included in the Iranian national immunization program, the questions about these items were removed (18). Furthermore, in light of the COVID-19 pandemic, a question was included regarding the utilization of the vaccine for this particular disease (19, 20).

Regarding the increasing trend of Road Traffic Accidents (RTAs), suicide, and the remarkable impact of nutrition on the occurrence of diseases, related items were added (21-28). Three items were removed from each race and phone number. The questions regarding the type of cancer, treatment, pain management, Prostate Cancer Screening (PCS), and decision-making were excluded because they focused on personal opinions about screening and treatment procedures. Four items related to Alcohol Consumption (AC) were decreased into 2 items.

Given the illegality of AC in Iran, there is a high probability of underreporting AC. Ten items on colorectal cancer screening were summarized in 5 items due to the inclusion of special terminology, which could potentially hinder comprehension among the population. In adverse childhood experiences, 3 items on sexuality were culturally merged. Two items related to industry were combined into the job status. Due to the high prevalence of hypertension, 2 items about hypertension-related behaviors were added (29).

In disability, walking and climbing stairs were divided into 2 items based on expert recommendations.

In step 6, the pre final version of the PBRFSSQ was completed by 10 subjects to determine whether their perceptions aligned with the intended meaning of each item. The final PBRFSSQ was obtained after conducting a psychometric test in the seventh step.

### Psychometric Testing

Content Validity (CV) was assessed using both quantita-

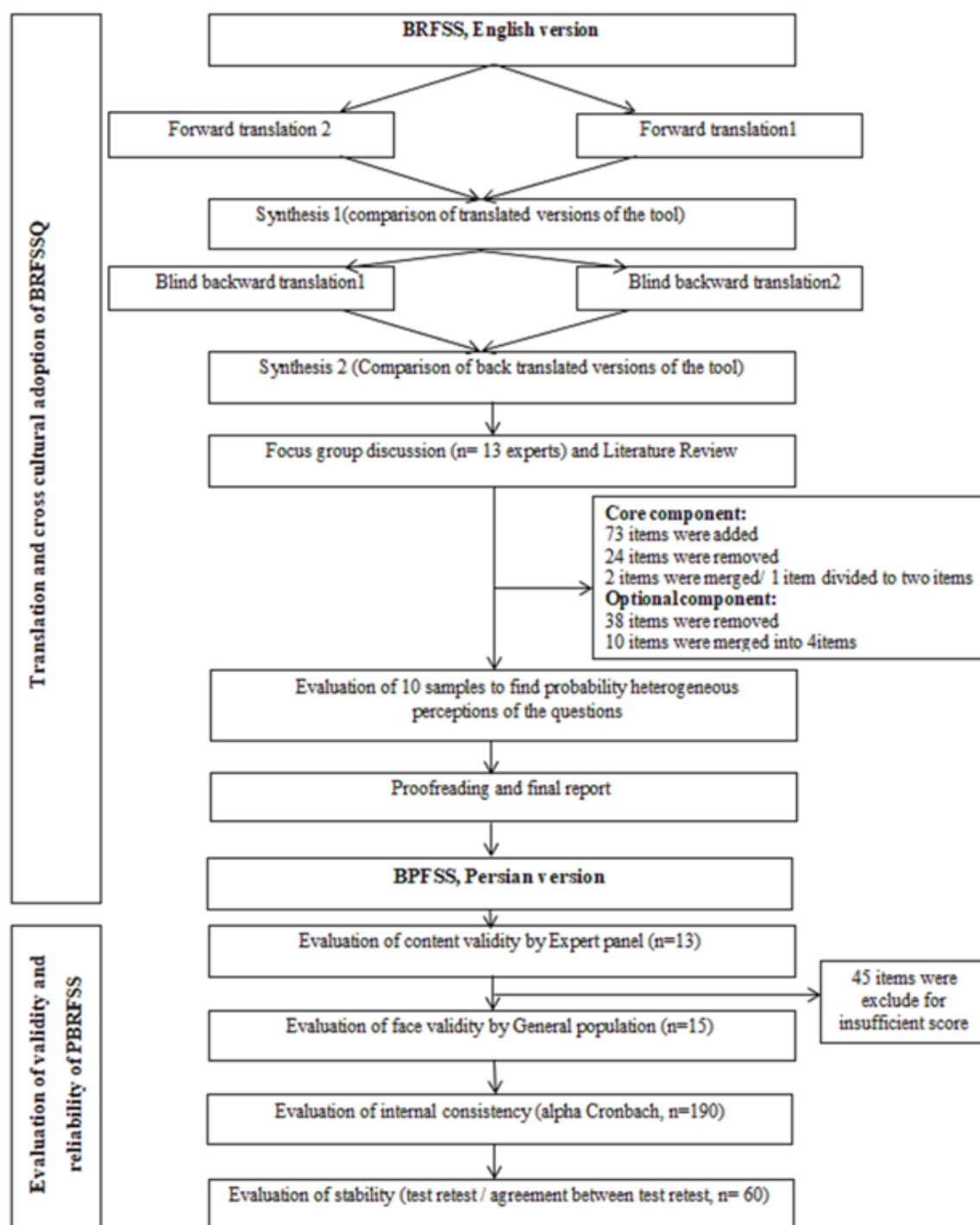


Figure 1. Translation, cross cultural adoption and validation of BRFSSQ

tive and qualitative methods. For this purpose, a second expert panel consisting of 13 experts was convened. Quantitative CV is evaluated by calculating the Content Validity Index (CVI) and Content Validity Ratio (CVR). Regarding the Lawshe CVR table, the minimum acceptable CVR is 0.54 (30, 31). The CVI consists of 2 types: Item CVI (I\_CVI) and Scale CVI (S\_CVI). The minimum acceptable I\_CVI and S\_CVI were 0.79 and 0.80, respectively (32).

The face validity of the PBRFSSQ was assessed from the

perspective of the population (32). To qualitatively evaluate the PBRFSSQ face validity, 15 participants were included. Items with an Impact Score (IS) >1.5 were considered suitable.

The ICC was calculated to assess the test-retest. Participants who recently completed the RFPBSSQ were asked to complete it again 21 to 30 days later using the recommendation of an expert panel. A 2-way mixed-effects model was used to compute the ICC (33). The Cronbach's alpha

coefficient was calculated to evaluate the internal consistency. An alpha coefficient of at least 0.70 was considered acceptable (34). The modified kappa (M\_kappa) coefficient is an index that measures the level of agreement among judges regarding the relevance of an item (34). Data were analyzed using the STATA software package Version 15.

## Results

Table 1 presents the demographic and socioeconomic characteristics of the participants. A total of 275 respondents participated in this study, with 19.27% aged 14-29 years and almost 69% aged 30-65 years. Also, 54.54% of participants were male. Approximately 75% of females and 73% of males were married. Of the total female respondents, 23.2% were either illiterate or had only completed primary education.

The CV of the PBRFSSQ was confirmed based on experts' opinions. To enhance the grammatical structure, researchers made slight revisions to the PBRFSSQ items based on experts' recommendations. Of the 189 items, 45 were extracted due to a  $CVR \leq 0.54$ . The  $I\_CVI$  was calculated to be  $\geq 0.8$ , and the  $S\_CVI$  was equal to 0.95.

From the perspective of 15 participants, there was no need to revise the items in terms of understanding and ease of completion. The IS was above 1.5 for all items (Table 2).

The ICC was computed as 0.86, 0.88, and 0.87 for the CC, OM, and total PBRFSSQ, respectively. The test-retest reliability analysis indicated that the ICC was  $>0.9$  for the following dimensions: health status, health days, health care access, demographics, tobacco use, lung cancer screening, hepatitis treatment, tetanus diphtheria vaccination, sex at birth, and child screening. The minimum ICC at the dimension level was 0.71 for HIV. Overall Cronbach's alpha of 0.85 was obtained (Table 3).

The M\_kappa was estimated to be excellent, ranging from 0.76 for HIV behavior to 1 for various dimensions.

## Discussion

This study aimed to develop and cross-culturally adopt and evaluate the validity and reliability of the Persian version of the BRFSSQ among the general population. The findings of this study showed good validity and reliability for the PBRFSSQ. Various studies have demonstrated a

Table 2. Results of face validity, content validity and agreement evaluation

| Item | Impact score | CVI  | CVR  | M-Kappa |
|------|--------------|------|------|---------|
| 1    | 4.9          | 1    | 1    | 1       |
| 2    | 4.8          | 1    | 1    | 1       |
| 3    | 4.7          | 1    | 0.85 | 1       |
| 4    | 4.8          | 1    | 0.85 | 1       |
| 5    | 4.7          | 1    | 0.85 | 0.90    |
| 6    | 4.6          | 0.92 | 0.85 | 1       |
| 7    | 4.9          | 1    | 0.85 | 0.90    |
| 8    | 4.8          | 0.92 | 0.85 | 0.76    |
| 9    | 4.5          | 0.85 | 0.85 | 0.90    |
| 10   | 4.6          | 0.92 | 0.85 | 1       |
| 11   | 4.7          | 1    | 0.85 | 0.90    |
| 12   | 4.6          | 0.92 | 0.85 | 1       |
| 13   | 5            | 1    | 0.85 | 1       |
| 14   | 4.9          | 1    | 0.85 | 0.90    |
| 15   | 5            | 0.92 | 0.85 | 1       |
| 16   | 4.4          | 1    | 1    | 1       |
| 17   | 4.7          | 1    | 1    | 1       |
| 18   | 4.7          | 1    | 1    | 1       |
| 19   | 4.4          | 1    | 0.69 | 1       |
| 20   | 4.9          | 1    | 0.69 | 0.90    |
| 21   | 4.8          | 0.92 | 0.85 | 1       |
| 22   | 4.9          | 1    | 0.85 | 1       |
| 23   | 4.5          | 1    | 0.85 | 0.90    |
| 24   | 4.6          | 0.92 | 0.85 | 1       |
| 25   | 4.5          | 1    | 0.85 | 1       |
| 26   | 4.8          | 1    | 0.85 | 0.90    |
| 27   | 4.6          | 0.92 | 0.85 | 0.90    |
| 28   | 4.5          | 0.92 | 0.85 | 1       |
| 29   | 4.3          | 1    | 0.85 | 1       |
| 30   | 4.3          | 1    | 0.69 | 1       |
| 31   | 4.2          | 1    | 0.85 | 1       |
| 32   | 3.9          | 1    | 0.85 | 0.90    |
| 33   | 3.7          | 0.92 | 0.69 | 0.90    |
| 34   | 4.5          | 0.92 | 0.85 | 0.90    |

significant association between high-risk behaviors and disease mortality and morbidity (6-8). The PBRFSSQ is a comprehensive tool that assesses and classifies key behaviors together as quickly as possible. Regarding the FGD, literature review, and the social, cultural, and health differences between the present study and the BRFSSQ, some items were modified in the PBRFSSQ. Items related to race, sexual orientation, and the amount of alcohol and marijuana consumption were removed from the PBRFSQ. Experts believe that race is not particularly relevant in Iran.

Table 1. Demographic Characteristics of the participants

| Variable         |                        | Male        | Female     | Total       |
|------------------|------------------------|-------------|------------|-------------|
|                  |                        | N (%)       | N (%)      | N (%)       |
| Age group (year) | 14-29                  | 31(20.66)   | 22 (17.6)  | 53 (19.27)  |
|                  | 30-65                  | 102 (68)    | 88 (70.4)  | 190 (69.09) |
|                  | $\geq 66$              | 17(11.33)   | 15 (12)    | 32 (11.73)  |
| Marital status   | Single                 | 37 (24.69)  | 21(16.8)   | 58 (21.09)  |
|                  | Married                | 109 (72.68) | 94 (75.2)  | 203 (73.81) |
|                  | Widow                  | 2 (1.33)    | 8 (6.4)    | 10 (3.65)   |
|                  | Divorce                | 2 (1.33)    | 2 (1.6)    | 4 (1.45)    |
| Education        | Illiterate and Primary | 34 (22.66)  | 29 (23.2)  | 63(22.90)   |
|                  | Secondary              | 65 (43.33)  | 55 (44)    | 120 (43.63) |
|                  | Undergraduate          | 35 (23.35)  | 29 (23.2)  | 64 (23.29)  |
|                  | Postgraduate           | 16 (10.66)  | 12 (9.6)   | 28 (10.18)  |
| Residency        | Urban                  | 129 (86)    | 104 (83.2) | 233 (84.73) |
|                  | Rural                  | 21 (14)     | 21(16.8)   | 42 (15.27)  |



Table 2. Continued

| Item | Impact score | CVI  | CVR  | M-Kappa |
|------|--------------|------|------|---------|
| 35   | 4.8          | 0.92 | 0.69 | 0.90    |
| 36   | 4.8          | 0.92 | 0.85 | 0.90    |
| 37   | 4.8          | 0.92 | 0.85 | 0.90    |
| 38   | 4.7          | 0.92 | 0.85 | 1       |
| 39   | 4.7          | 1    | 0.85 | 1       |
| 40   | 4.1          | 1    | 0.85 | 0.90    |
| 41   | 4.5          | 0.92 | 0.85 | 0.90    |
| 42   | 4.4          | 0.92 | 0.85 | 0.90    |
| 43   | 4.3          | 0.92 | 0.85 | 0.90    |
| 44   | 4.6          | 0.92 | 0.85 | 0.76    |
| 45   | 4.9          | 0.85 | 0.85 | 0.76    |
| 46   | 4.6          | 0.85 | 0.85 | 0.90    |
| 47   | 4.7          | 0.92 | 0.69 | 0.76    |
| 48   | 4.5          | 0.85 | 0.69 | 0.76    |
| 49   | 4.6          | 0.85 | 0.69 | 0.90    |
| 50   | 4.7          | 0.92 | 0.69 | 0.90    |
| 51   | 4.9          | 0.92 | 0.69 | 1       |
| 52   | 4.8          | 1    | 0.69 | 0.90    |
| 53   | 4.7          | 0.92 | 0.85 | 1       |
| 54   | 4.9          | 1    | 0.85 | 1       |
| 55   | 4.9          | 1    | 0.85 | 1       |
| 56   | 4.9          | 1    | 0.69 | 0.90    |
| 57   | 4.7          | 0.92 | 0.69 | 0.90    |
| 58   | 4.8          | 0.92 | 0.85 | 0.90    |
| 59   | 4.8          | 0.92 | 0.85 | 0.90    |
| 60   | 4.7          | 0.92 | 0.85 | 1       |
| 61   | 4.6          | 1    | 0.85 | 1       |
| 62   | 4.5          | 1    | 0.85 | 1       |
| 63   | 4.8          | 1    | 0.85 | 1       |
| 64   | 4.6          | 1    | 0.85 | 0.90    |
| 65   | 4.8          | 0.92 | 0.69 | 0.90    |
| 66   | 4.3          | 0.92 | 0.85 | 0.90    |
| 67   | 4.7          | 0.92 | 0.85 | 0.90    |
| 68   | 4.8          | 0.92 | 1    | 0.90    |
| 69   | 4.8          | 0.92 | 0.85 | 1       |
| 70   | 4.8          | 1    | 1    | 0.90    |

Table 2. Continued

| Item | Impact score | CVI  | CVR  | M-Kappa |
|------|--------------|------|------|---------|
| 71   | 4.5          | 0.92 | 1    | 0.90    |
| 72   | 4.7          | 0.92 | 0.85 | 1       |
| 73   | 4.8          | 1    | 0.85 | 1       |
| 74   | 4.6          | 1    | 0.85 | 1       |
| 75   | 4.7          | 1    | 0.85 | 0.90    |
| 76   | 4.9          | 0.92 | 0.85 | 1       |
| 77   | 4.6          | 1    | 0.85 | 1       |
| 78   | 4.6          | 1    | 0.85 | 1       |
| 79   | 4.8          | 1    | 0.85 | 0.90    |
| 80   | 4.7          | 0.92 | 0.85 | 1       |
| 81   | 4.6          | 1    | 0.85 | 1       |
| 82   | 4.5          | 1    | 0.85 | 1       |
| 83   | 4.4          | 1    | 0.85 | 1       |
| 84   | 4.4          | 1    | 0.85 | 0.90    |
| 85   | 4.4          | 0.92 | 0.85 | 0.90    |
| 86   | 4.3          | 0.92 | 0.85 | 0.90    |
| 87   | 4.7          | 0.92 | 0.85 | 0.90    |
| 88   | 4.8          | 0.92 | 0.85 | 0.90    |
| 89   | 5            | 0.92 | 0.85 | 0.90    |
| 90   | 4.8          | 0.92 | 1    | 0.90    |
| 91   | 5            | 0.92 | 0.69 | 1       |
| 92   | 4.9          | 1    | 0.85 | 0.90    |
| 93   | 4.7          | 0.92 | 1    | 0.90    |
| 94   | 4.7          | 0.92 | 1    | 0.90    |
| 95   | 5            | 0.92 | 1    | 0.90    |
| 96   | 4.7          | 0.92 | 1    | 0.90    |
| 97   | 4.8          | 0.92 | 1    | 1       |
| 98   | 4.7          | 1    | 0.85 | 0.90    |
| 99   | 4.8          | 0.92 | 1    | 1       |
| 100  | 4.9          | 1    | 0.69 | 0.90    |
| 101  | 4.9          | 0.92 | 1    | 1       |
| 102  | 4.7          | 1    | 0.85 | 0.90    |
| 103  | 4.7          | 0.92 | 1    | 0.90    |
| 104  | 4.7          | 0.92 | 0.69 | 1       |
| 105  | 4.7          | 1    | 0.85 | 0.90    |
| 106  | 4.7          | 0.92 | 0.85 | 0.90    |
| 107  | 4.9          | 0.92 | 0.85 | 0.90    |
| 108  | 4.7          | 0.92 | 0.85 | 0.90    |
| 109  | 4.9          | 0.92 | 0.85 | 0.90    |

Moreover, experts stated there is no need to obtain information on telephone lines, as this tool will be completed via self-report.

Based on the literature, suicide is the third cause of death in the ages of 15 to 29 years in Iran. Therefore, questions related to suicide were included in the tool (35). As a result, items associated with RTAs have been added (22, 36).

Finally, the validity and reliability of the PBRFSSQ were approved. The findings of this study indicated that tobacco use and demographic factors were highly stable. Previous studies reported high stability for the demographic domain (37, 38).

The results showed that the stability and internal consistency of the chronic health conditions domain were more outstanding than in other studies (39). The findings indicate that the exercise domain has a high level of reliability. In studies conducted by Shea et al and Brownson et al, high stability was reported for the demographic domain (40, 41).

The minimum ICC has been reported for HIV. This may result from cultural issues. People may be reluctant to provide that information correctly because of social stigma.

Another widely used section of the BRFSSQ is the tobacco use domain. We have achieved good reliability in this domain and in previous studies (42, 43).

Like most psychometric studies, our study is limited by carry over effect. To reduce this, we set a time interval between the test and retest with the recommendation of the

behavioral science professors.

## Conclusion

Regarding the results of the present study, the developed PBRFSSQ was valid and reliable for assessing risky behaviors among the Iranian population. Adequate face and content validity, internal consistency and stability reveals that the tool measures risky behavior status and delivers high reliable score at item level and total score in this representative sample. Therefore, PBRFSSQ can be used in studies related to health system evaluation in Iran. In addition, it can be used to prioritize and plan the allocation of resources needed for health based on the needs of the population.

## Ethics Approval

The ethics committee approved the study protocol at Tabriz University Medical of Sciences (Ref No. 1400.614). Written informed consent was obtained.

## Acknowledgment

The authors are thankful to the staff of the Asadabadi Hospital of Tabriz University of Medical Sciences (TUMS) and all the participants who helped us conduct the study. This is a part of the Ph.D. thesis registered in Tabriz University of Medical Sciences with Number 69209 by Elham Davtalab Esmaeili.

Table 2. Continued

| Item  | Impact score | CVI  | CVR  | M-Kappa |
|-------|--------------|------|------|---------|
| 110   | 4.8          | 0.92 | 1    | 0.90    |
| 111   | 4.9          | 0.92 | 0.85 | 1       |
| 112   | 4.7          | 1    | 0.85 | 0.90    |
| 113   | 4.7          | 0.92 | 0.85 | 0.90    |
| 114   | 4.7          | 0.92 | 0.85 | 0.90    |
| 115   | 4.9          | 0.92 | 0.85 | 0.90    |
| 116   | 4.7          | 0.92 | 0.85 | 0.90    |
| 117   | 4.7          | 0.92 | 0.85 | 0.90    |
| 118   | 5            | 0.92 | 1    | 1       |
| 119   | 5            | 1    | 0.85 | 0.90    |
| 120   | 4.8          | 0.92 | 1    | 0.90    |
| 121   | 4.9          | 0.92 | 0.85 | 0.90    |
| 122   | 4.7          | 0.92 | 0.85 | 0.90    |
| 123   | 4.4          | 0.92 | 1    | 0.90    |
| 124   | 4.6          | 0.92 | 0.85 | 0.90    |
| 125   | 4.5          | 0.92 | 0.85 | 0.90    |
| 126   | 4.5          | 0.92 | 0.85 | 0.90    |
| 127   | 4.6          | 0.92 | 0.85 | 0.90    |
| 128   | 4.9          | 0.92 | 0.85 | 0.90    |
| 129   | 4.9          | 0.92 | 0.85 | 0.90    |
| 130   | 4.8          | 0.92 | 0.85 | 0.90    |
| 131   | 5            | 0.92 | 0.85 | 0.90    |
| 132   | 4.9          | 0.92 | 0.85 | 0.90    |
| 133   | 4.7          | 0.92 | 0.85 | 0.90    |
| 134   | 4.7          | 0.92 | 0.85 | 0.90    |
| 135   | 4.6          | 0.92 | 0.85 | 0.90    |
| 136   | 4.8          | 0.92 | 1    | 0.90    |
| 137   | 4.9          | 0.92 | 0.85 | 0.90    |
| 138   | 4.9          | 0.92 | 0.85 | 0.76    |
| 139   | 4.8          | 0.85 | 0.85 | 0.76    |
| 140   | 4.8          | 0.85 | 0.85 | 0.90    |
| 141   | 4.7          | 0.92 | 0.85 | 0.90    |
| 142   | 4.9          | 0.92 | 0.85 | 0.90    |
| 143   | 4.7          | 0.92 | 0.85 | 0.90    |
| 144   | 4.8          | 0.92 | 0.85 | 0.90    |
| Total | 4.69         | 0.95 | 0.85 | 0.93    |

### Conflict of Interests

The authors declare that they have no competing interests.

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Table 3. Results of reliability test of PBRFSSQ

| Domain              | Test -retest stability               |        | Internal consistency |
|---------------------|--------------------------------------|--------|----------------------|
|                     | ICC                                  | 95% CI | Alpha-Cronbach       |
| Core component      | Health Status                        | 0.91   | 0.85-0.95*           |
|                     | Healthy Days                         | 0.91   | 0.86-0.94*           |
|                     | Health Care Access                   | 0.93   | 0.86-0.96*           |
|                     | Exercise                             | 0.86   | 0.72-0.93*           |
|                     | Inadequate Sleep                     | 0.86   | 0.72-0.93*           |
|                     | Chronic Health Conditions            | 0.88   | 0.75-0.94*           |
|                     | Oral Health                          | 0.89   | 0.86-0.96            |
|                     | Demographics                         | 0.99   | 0.93-1*              |
|                     | Disability                           | 0.82   | 0.79-0.84*           |
|                     | Falls                                | 0.82   | 0.79-0.84*           |
|                     | Tobacco Use                          | 0.99   | 0.98-0.99*           |
|                     | Alcohol Consumption                  | 0.78   | 0.74-0.83*           |
|                     | Immunization                         | 0.81   | 0.91-0.99*           |
|                     | Behavior related traffic accident    | 0.76   | 0.69-0.87*           |
|                     | Breast and Cervical Cancer Screening | 0.87   | 0.73-0.93*           |
|                     | Colorectal Cancer Screening          | 0.75   | 0.70-0.79*           |
|                     | H.I.V/AIDS                           | 0.71   | 0.4-0.86*            |
|                     | Suicide                              | 0.87   | 0.74-0.97*           |
|                     | Nutrition                            | 0.84   | 0.79-0.89*           |
| Optional components | Prediabetes                          | 0.88   | 0.75-0.94*           |
|                     | Diabetes                             | 0.86   | 0.72-0.93*           |
|                     | ME/CFS                               | 0.79   | 0.56-0.9*            |
|                     | Hepatitis Treatment                  | 0.92   | 0.89-0.95*           |
|                     | Health Care Access                   | 0.78   | 0.72-0.84*           |
|                     | Cognitive Decline                    | 0.78   | 0.72-0.84*           |
|                     | Marijuana Use                        | 0.78   | 0.74-0.83*           |
|                     | Lung Cancer Screening                | 0.97   | 0.91-0.99*           |
|                     | Tetanus Diphtheria vaccination       | 0.97   | 0.91-0.99*           |
|                     | Sex at Birth                         | 0.99   | 0.93-1*              |
|                     | Adverse Childhood Experiences        | 0.88   | 0.75-0.94*           |
|                     | Child screening                      | 0.92   | 0.89-0.95*           |
|                     | Core component                       | 0.86   | 0.79-0.91*           |
|                     | Optional component                   | 0.88   | 0.81-0.92*           |
|                     | Total                                | 0.87   | 0.82-0.92*           |

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