Belief-based Tobacco Smoking Scale: Evaluating the Psychometric Properties of the Theory of Planned Behavior's Constructs

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ARTICLE INFO	ABSTRACT
  *Corresponding Author: *Alireza Hidarnia* *Tel:+98 21 8288 3817;* *e-mail:* *hidarnia@modares.ac.ir*	**Background:** At present, there are no comprehensive validated instruments for measuring adolescents' beliefs regarding tobacco smoking in the Iranian society. This study aimed to evaluate the validity, reliability and feasibility of the belief-based tobacco smoking scale using the Theory of Planned Behavior's (TPB) constructs as a theoretical framework. **Methods:** This cross-sectional validation study was carried out on 410 male adolescents of Hamadan, west of Iran, recruited through multi-stage random sampling method. Reliability was assessed by internal consistency and Intraclass Correlation Coefficient (ICC). In addition, Confirmatory Factor Analyses (CFA) and Exploratory Factor Analyses (EFA) were performed to test construct validity. Content validity was examined using Content Validity Index (CVI) and Content Validity Ratio (CVR). **Results:** Results obtained from factor analysis showed that the data was fit to the model (χ^2=391.43, $P<0.001$) and TPB consisted of 22 items measuring seven components which explaining 69.7% of the common variance. The mean scores for the CVI and CVR were 0.89 and 0.80; respectively. Additional analyses indicated acceptable results for internal consistency reliability values ranging from 0.55 to 0.92. **Conclusion:** The belief-based tobacco smoking questionnaire is a reliable and valid instrument and now is acceptable and suitable and can be used in future studies.

Introduction

Tobacco smoking is the least notable substance compared to drugs that is easily accessible and has little social indecency, which adolescents smoke it easily and addict due to the continuous use.[1-3] At present, there are approximately one billion smokers in the world and it is estimated that by 2030 one billion people of younger adults will start smoking and out of about 3 million people die from tobacco smoking annually in the world, one million live in developing countries.[4] Although

there is a progressive trend of smoking in developing countries, the age of smoking onset is under declining.[5] In Iran as developing countries the tobacco use is known as one of the significant problems among adolescents, where the initiation age of tobacco use is reported between 13 to 18 years old.[6] The tobacco smoking prevalence among adolescents is in the range of 11 to 25 percent.[6-8]

Scientists declared that adolescents' interest to cigarette and consequently initiation of tobacco smoke is a complex and ambiguous process.[1,9] There are numerous determinant factors that effect on tobacco smoking include low socioeconomic status, governmental healthy policies, and peer pressure alongside cognitive factor like attitudes, subjective norms, and self-efficacy which they have a major relation for smoking among adolescence.[6,8] However, further studies are needed to determine how to keep adolescence safe from tobacco smoking; available evidence suggests that analytical studies will be effective when theory-based approaches such as social cognitive models are used.[10] Social cognitive models have focused on understanding of cognitive determinants of social behaviors because it is assumed that cognitive determinants are more flexible compared to other behavioral factors.[11]

Among the existing theories, the TPB is known as the applicable theories which explain how adolescents engage in the risky behaviors.[12] TPB was proposed and introduced in 1988 by Ajzen by developing the Theory of Reasoned Action which it consists of five constructs of attitudes, subjective norms, perceived behavioral control, behavioral intention and behavior.[13] According to the TPB, a people's intention to perform a specific behavior is assumed to be the central determinant that the behavior will be performed.[14] Behavioral intention is predicted by attitudes (the person's positive or negative evaluation of performing the particular behavior), subjective norms (the person's perception of social pressure), and perceived behavioral control (person's perceived confidence in the ability to perform a behavior).[13]

According to the TPB, each predictor may be measured directly e.g. by assessing major constructs of theory or indirectly e.g. by assessing minor constructs of theory (Figure 1). Direct and indirect approaches make diverse assumptions about the underlying predictors and neither approach is perfect.[15] In fact, indirect (belief-based) measures focused on the cognitive dimensions of the TPB. According to the this approach, human behavior is guided by three types of considerations: beliefs about the perceived consequences of an action (behavioral beliefs), beliefs about the perceptions of significant others' preferences about whether one should perform a behavior (normative beliefs), and beliefs about the likelihood that one possesses the resources and opportunities thought necessary to execute the behavior (control beliefs).[15-16]
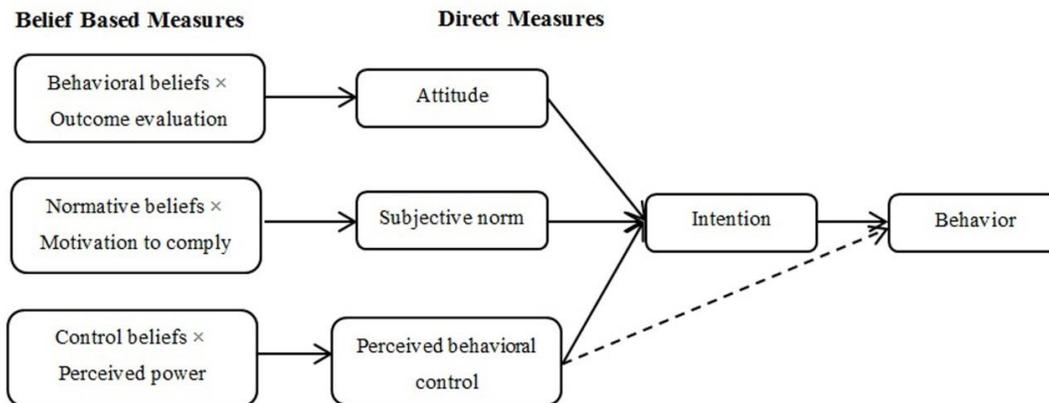

Figure 1: Theory of Planned Behavior, Direct and Indirect Variables

Several evidences emphasized on the effectiveness of the TPB constructs for explaining tobacco smoking related behaviors between adolescents as well as strategies which have designed for prevention of smoking by using this theory.[17-18] As Ajzen suggests that there is essential to design an appropriate questionnaire to specific behaviors and population.[19] On the other hand, despite numerous questionnaires of the TPB with the original language,[19-21] there have been little studies about the validation of TPB questionnaire on tobacco smoking in Iran so far. At the present, there were two studies assess the direct measures of the TPB including attitude, subjective norm and perceived behavioral control to predict tobacco smoking intentions of adolescents.[6,17]

According to available evidence, most of the questionnaires in the previous study were measured TPB constructs via direct method. Therefore, the development of valid questionnaire to measure tobacco smoking behavior based on TPB constructs via indirect method is essential.

Due to the lack of a valid instrument for measuring tobacco smoking related beliefs in the context of indirect measures of the TPB among and during adolescent period; this study was conducted with three aims: (a) evaluating the factor structure of the scale in a sample of Iranian male adolescents using EFA; (b) determining the content and face validity of measures based on the obtained opinions from specialists and participants; and (c) assessing reliability of questionnaire using internal consistency and ICC.

Materials and Methods

Participants and procedures

This cross-sectional validation study was performed in Hamadan, the west of Iran, from February to June 2014. Sample size was estimated based on the number of items in the questionnaire multiplying by 10 as recommended (32×10=320).[22] However, since there was a risk for incomplete questionnaires, 410 male adolescents were recruited. Data for this study come from male students who attended 10 Hamadan high schools. Participants were selected using a multi-stage random sampling method that incorporated clustering and simple sampling. At the first stage, sampling was conducted based on the cluster method. Each cluster included 41 students in different sections of the city. The choice of 41students for the cluster size was based on 2-day performance capacity of the data collection group of two interviewers. The statistical framework used was based on the high school lists available in Ministry of Education in Hamadan Province. At the second stage, students in every school to be enrolled in the study were selected through simple sampling method.

The inclusion criteria were being high school student, aged between 14 to 18 years, and consent to participate in the study. Exclusion criteria included the discontent to participate in the study, and history of mental disorders in the participant. Data collection methods were based on anonymous questionnaires that were completed by 2 trained interviewers.These interviewers received instructions for identical completing the questionnaires after attending a briefing.

The scale development process

Scale development was performed through various steps (Figure 2). First step was performed to determine content domain of a construct. In this step, we generated an item pool extracted from the literature relating to the TPB.[23-29] The fundamental dependent variable in this analysis was tobacco smoking. Besides, The independent or predictor variables include 7 factors, organized into logical framework including (a) behavioral beliefs; (b) evaluation of behavioral outcomes; (c) normative beliefs; (d) motivation to comply; (e) control beliefs; (f) perceived power; and (g) behavioral intention. Overall, 32 items were extracted for these variables (Table 1).

In the second step, psychometric properties of the Iranian version of the theory-based tobacco smoking beliefs questionnaire was performed to evaluate validity and reliability of instrument.

Table 1: Theory-based Tobacco Smoking Beliefs items extracted from the literature in the context of TPB

Item	Construct	Indirect Measure	Item pools	Sources
1	Attitude	Behavioral Beliefs*	Tobacco smoking would be reduces nervousness	Barati, et al [25],
2			Tobacco smoking would be loss money	Bashirian, et al [8],
3			Tobacco smoking would be forget problems	Bashirian, et al [26],
4			Tobacco smoking would be more and better presences with friends	Bashirian, et al [29], Moeini, et al [24]
5			Tobacco smoking would be malodor of oral and clothing	
6			Tobacco smoking is enjoyable	
7		Outcome Evaluation*	If I tobacco smoking, This will help me to calm	Jalilian, et al [27],
8 #			If I tobacco smoking, This will help me to forget problems	Barati, et al [25],
9			If I tobacco smoking, This will help me to more and better presences with friends	Allahverdipour, et al [23],
10 #			If I tobacco smoking, My money would be loss	Bashirian, et al [8],
11			If I tobacco smoking, Mouth and my clothes would be funky	Bashirian, et al [26], Dehdari, et al [28],
12 #			If I tobacco smoking, This is enjoyable for me	Bashirian, et al [29], Moeini, et al [24]
13	SN	Normative Beliefs**	My best friend thinks I should not or should tobacco smoking.	Barati, et al [25], Bashirian, et al [8],
14			My other friends think I should not or should tobacco smoking.	Bashirian, et al [26], Bashirian, et al [29],
15 #			My parents think I should not or should tobacco smoking.	Moeini, et al [24]
16 #			My teachers think I should not or should tobacco smoking.	
17		Motivation to Comply*	With regards to tobacco smoking, I want to do what my best friend thinks I should.	Jalilian, et al [27], Barati, et al [25],
18			With regards to tobacco smoking, I want to do what my other friends think I should.	Allahverdipour, et al [23],
19 #			With regards to tobacco smoking, I want to do what my parents think I should.	Bashirian, et al [8], Karimy, et al [17]
20 #			With regards to tobacco smoking, I want to do what my teachers think I should.	Dehdari, et al [28], Bashirian, et al [29], Moeini, et al [24]
21	PBC	Control Beliefs***	I am in a good mood.	Barati, et al [25],
22			I am in a bad mood.	Bashirian, et al [8],
23 #			I am tempted to tobacco smoking.	Bashirian, et al [26],
24 #			I have access to cigarettes.	Bashirian, et al [29], Moeini, et al [24]
25		Perceived power****	Being in a good mood makes my taking tobacco smoking	Jalilian, et al [27],
26			Being in a bad mood makes my taking tobacco smoking	Barati, et al [25],
27			Temptation makes my taking tobacco smoking	Allahverdipour, et al [23],
28			Access to cigarettes makes my taking tobacco smoking	Bashirian, et al [8], Bashirian, et al [26], Dehdari, et al [28], Bashirian, et al [29], Moeini, et al [24]
29	BI	Behavioral Intention*	I intend to tobacco smoking in the next month	Karimy, et al [17]
30			I intend to tobacco smoking in the next 6-month	Karimy, et al [6]
31			I intend to tobacco smoking in the next year	
32 #			It is likely that desire to smoke with friends in future	

Note. SN: Subjective Norms, PBC: Perceived Behavioral Control, BI: Behavioral Intention, *****Response categories was rated on a five-point Likert scale (1=strongly agree; 2=strongly disagree), ******Response categories was rated on a five-point Likert scale (1=very high; 2=very low), *******Response categories was rated on a five-point Likert scale (1=always; 2=never), ********Response categories was rated on a five-point Likert scale (1= very likely; 2= very unlikely), **#**Deleted items in the final version.
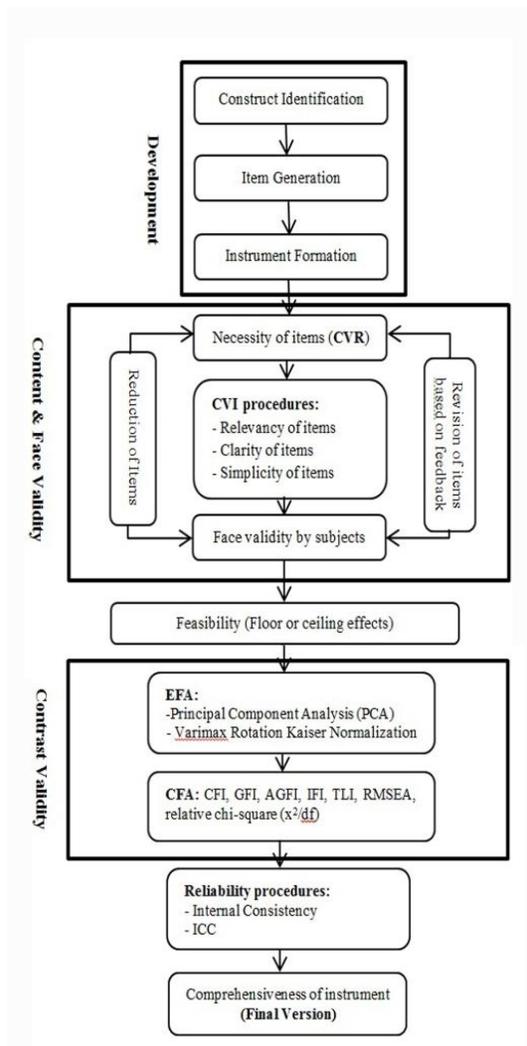
Figure 2: A flow chart depicting the process used to evaluating the psychometric properties

Validity

We assessed construct, face, and content validity of the Iranian version of the theory-based tobacco smoking beliefs questionnaire as follows:

Construct validity: The EFA was performed to determine the dimensionality of the questionnaire (or structure detection). The aim of EFA is to examine the underlying relationships between the variables. EFA was performed by Principal Component Analysis (PCA) extraction method and utilizing Varimax Rotation Kaiser Normalization. In order to evaluate sampling adequacy to perform a satisfactory factor analysis, Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and

Bartlett test was calculated. In addition, the CFA was conducted in order to assess how well the model extracted by EFA and the theoretical framework behind the instrument fitted the observed data.

Face validity: The face validity was performed among 10 male students who were similar to the target population. Face validity was applied in two phases (qualitative and quantitative). Qualitative phase was performed to insure that participants understood questions and had no difficulties in responding to Iranian version of the theory-based tobacco smoking beliefs questionnaire. In addition, quantitative phase was performed to calculated the impact score (frequency×importance) to indicate the proportion of participants who identified the question was important or quite important. Items were considered appropriate if they had an impact score equal to or greater than 1.5 (which corresponds to a mean frequency of 50% and a mean importance of 3 on the 5-point Likert scale).[30]

Content validity: In this step, we carried out an expert panel of 10 specialists in health education, and psychologists to calculate content validity. Items were slightly modified based on specialists' comments. The purpose of this step was to ensure that the instrument was clear and culturally relevant. Content validity was applied in two phases (qualitative and quantitative). The qualitative phase was conducted by 10 experts who reviewed the items of the questionnaire for grammar, wording, item allocation and scaling of the questionnaire. The quantitative phase was conducted to calculate CVI and CVR. CVR examines the essentiality of each item for the Iranian culture by using 3-points rating scale (essential, useful but not essential, and not essential).[31] The CVR for every item was calculated using formula $CVR = [N_e - (N/2)] \div (N/2)$ (N_e is the number of panelists indicating "essential" for each particular item and N is the total number of panelists). The numeric value of CVR is determined by Lawshe table. According to the Lawshe table, an acceptable CVR value for 10 panelists is 0.62.[32] To obtain CVI for relevancy, simplicity and clarity of each item, ordinal scale

with four possible responses was used. The responses include a rating from 1 = not relevant, not simple and not clear to 4 = very relevant, very simple and very clear. The number of those judging the item as relevant or clear (rating 3 or 4) was divided by the number of content experts. Polite and Beck recommended 0.79 for the acceptable lower limit for CVI value.[33]

Reliability

Finally, internal consistency reliability was performed on the data that was from the total sample for the indirect measures of TPB constructs. To determine the reliability of the instrument, the internal consistency was tested using the Chronbach's alpha coefficient. We also estimated ICC in order to assess the stability.

Procedure and Ethical Considerations

This study was approved by institutional review board and Ethics Committee of Tarbiat Modares University. Interviewers while introducing themselves to participants expressed the aim of this study and ensured participants that all questionnaires while preserving the confidentiality would totally use for statistical analysis. Informed consent was obtained from all study participants before the project began.

Statistical Analysis

EFA was performed to determine the dimensionality of the questionnaire using the principal component analysis with varimax rotation. Factor loading values of 0.5 or higher were considered acceptable and show that there is important relationship between items and factors.[34] In order to evaluate sampling adequacy to perform a satisfactory factor analysis, KMO Measure of Sampling Adequacy and Bartlett test was calculated. High values of KMO (more than 0.7) generally indicate that a factor analysis may be useful with the data. Criteria used to determine the subscales (factors) were minimum eigenvalues >1.00 (Kaiser Criterion).

In CFA, the following fit indices were selected to interpret the fit of the model to the data: the

goodness of fit index (GFI), the comparative fit index (CFI), Adjusted Goodness of Fit Index (AGFI), the root mean square error of approximation (RMSEA), relative chi-square values ($\chi2/df$). Value of the GFI, CFI and AGFI >0.9, and RMSEA ≤0.08, Chi-squared/df ≤3 were considered as acceptable model fit.

Feasibility was examined with floor and ceiling effects; and performed by exploring response rate and the proportion of missing data for each item. Floor or ceiling effects of the scale were considered present if more than 15% of respondents achieve the lowest or highest possible score, respectively.[35]

To determine the reliability of the instrument, the internal consistency was tested using the Chronbach's alpha coefficient. The alpha values of 0.50 or above were considered acceptable. The following category was selected to interpret the agreement levels: α≤0.5 was considered unacceptable, 0.50-0.60 poor, 0.60-0.70 moderate, 0.70-0.80 good, 0.80-0.9 very good, and >0.90 excellent.[22] ICC was computed for evaluating scale stability. For ICC we randomly selected 30 participants to complete the scale 2-4 weeks after the participant had completed the scale for the first time. We compared the test-retest scores for each construct using Pearson correlation test. ICC values higher than 0.40 was considered as satisfactory. The following category was selected to interpret the agreement levels: ICCs≤0.4 was considered poor to fair, 0.41-0.60 moderate, 0.61-0.80 fine, and >0.80 excellent.[36]

Scoring

In the final version of questionnaire, For each construct a minimum of two and a maximum of 6 items were developed, with an average of 4 items for each construct. Items measuring were adapted from previously published questionnaires. In this study, behavioral beliefs and outcome evaluation toward tobacco smoking were assessed with 6 and 3 items, respectively. The items were rated on a 5-point scale ranging from 1 *(strongly disagree)* to 5 *(strongly agree)*. Higher scores indicate more positive attitude to tobacco smoking. Normative beliefs were measured in relation to best friend and other

friends. The items were rated on a 5-point scale ranging from 1 *(very low)* to 5 *(very high)*. Motivation to comply with each of the referent groups was measured with items for each group. The items were rated on a 5-point scale ranging from 1 *(strongly disagree)* to 5 *(strongly agree)*. Higher scores indicate more subjective norms persuasive to tobacco smoking. The control beliefs scale consisted of two items that are rated on a 5-point Likert scale ranging from 1 (infrequently) to 5 (frequently). Power item measures were taken for each of the control beliefs and two other items which was rated on a 5-point scale ranging from 1 (less likely) to 5 (more likely). Higher score indicating more beliefs that support against with tobacco smoking. Intention to use was measured using a three item. The items were rated on a 5-point scale ranging from 1 *(very likely)* to 5 *(very unlikely)*. Higher scores indicate intention to use more frequently.

Data analysis was performed by SPSS version 16 (SPSS Inc., Chicago, IL, USA). In addition, the AMOS software version 16 was used for the CFA. P-values less than 0.05 were considered as significant for all statistical tests.

Results

Socio-demographic characteristic

Overall, 410 male adolescents were entered into the study. Age of respondents ranged from 14 to 18 years, with a mean age of 16.42 years (SD=0.89). Almost majority of the participants (83.2%) were in eleventh and twelfth grades. Regarding the educational status, 38.8% of respondents were natural sciences, 18% were mathematics, and 16.6% and 26.6% were human sciences and technical, respectively. Father's job of more than one-quarters of the participants (39.3%) was free job and majority of the participants (91.5%) had housewife mothers. At baseline, 5.1% of students reported that they lived with the exception of both parents. Sixty one (14.8%) of participants had fathers who were always smoker, 113 (27.4%) participants had fathers who were occasionally smoker. A number of 45 subjects (11%) had always smoker friends and 128 (31.3%) of subjects

had occasionally smoker friends. In addition, 17.2% of participants reported that had used history of tobacco smoking, and the mean smoking initiation age was13.73±2.22 year in them. The characteristics of the study sample are shown in Table 2.

Table 2: Summary statistics for characteristics of study participants (n=410)

Variables	Frequency	Percent
Grade		
Tenth	69	16.8
Eleventh	133	32.4
Twelfth	208	50.8
Major		
Natural Sciences	159	38.8
Mathematics	74	18.0
Human Sciences	68	16.6
Technical & Occupational	109	26.6
Father's job		
Worker	80	19.5
Employee	102	24.9
Free Job	161	39.3
Retired	38	9.2
Unemployed	29	7.1
Mother's job		
Housewife	375	91.5
Employed	35	8.5
Living status		
Both parents	389	94.9
Father	5	1.3
Mother	8	1.9
Other	8	1.9
Smoker father		
Always	61	14.8
Occasionally	113	27.4
Never	236	57.8
Smoker friend		
Always	45	11.0
Occasionally	128	31.3
Never	237	57.7
Tobacco smoking		
Always	11	2.7
Occasionally	60	14.5
Never	339	82.8
Age*	16.42 (±0.89)	
Smoking initiation age*	13.73 (±2.22)	

*For this variable, Mean (Std. Deviation) is reported

Feasibility

The results revealed that no Ceiling effect or Floor effect for the Iranian version of belief-based tobacco smoking questionnaire.

Content Validity

In qualitative evaluation of the measure, all criteria including grammar, wording, scaling of the questionnaire and item allocation were found to be appropriate. In addition, the result of quantitative content validity showed that the mean scores for the CVI and CVR were 0.89 and 0.80; respectively.

Face Validity

The result of quantitative face validity showed that affects score was equal or greater than 1.5 for all items. In the qualitative face validity, participants reported small changes in the wording of some items for more clarification.

EFA

The results of EFA are shown in Table 3. The KMO and Bartlett's test demonstrated that the data was appropriate for factor analysis (KMO index = 0.836, χ^2=391.43, P<0.001). Principal component analysis with Varimax rotation identified seven factors with eigenvalues greater than 1 and factor loading equal or greater than 0.50; accounting for 69.7% of variance observed. The factor loadings were as follows: (a) Factor 1 (Perceived power) including 4 items (item 25, 26, 27and 28); (b) Factor 2 (Behavioral beliefs) including 6 items (item 1, 2, 3, 4, 5 and 6); (c) Factor 3 (Behavioral intention) including 3 items (item 29, 30 and 31); (d) Factor 4 (Motivation to comply) including 2 items (item17 and 18); (e) Factor 5 (Evaluation of behavioral outcomes) including 3 items (item7, 9 and 11);(f) Factor 6 (Normative beliefs) including 2 items (item13 and 14); (g) Factor 7 (Control beliefs) including 2 items (item 21, and 22).

Table 3: Factor Loadings of theory of planned behavior's constructs obtained from EFA

| Items	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7
Q26	**0.876**	-0.123	-0.078	-0.172	-0.067	-0.101	-0.026
Q28	**0.868**	-0.144	-0.167	-0.118	-0.081	-0.133	-0.036
Q25	**0.834**	-0.170	-0.148	-0.126	-0.011	-0.082	-0.057
Q27	**0.814**	-0.123	-0.211	-0.068	-0.103	-0.096	-0.161
Q6	-0.091	**0.803**	0.109	0.013	0.143	0.025	0.119
Q2	-0.110	**0.747**	0.194	0.008	0.187	0.078	0.113
Q3	-0.090	**0.682**	0.069	0.228	0.150	0.185	0.004
Q4	-0.155	**0.660**	0.065	0.041	0.121	0.228	0.062
Q5	-0.017	**0.652**	0.065	0.299	0.046	0.117	0.102
Q1	-0.159	**0.644**	0.113	0.048	0.108	0.120	0.002
Q30	-0.163	0.153	**0.875**	0.031	0.076	0.049	0.079
Q29	-0.155	0.068	**0.858**	0.139	0.028	0.014	0.062
Q31	-0.206	0.046	**0.839**	0.105	0.028	0.192	0.070
Q17	-0.194	0.080	0.094	**0.875**	0.101	0.008	0.037
Q18	-0.219	0.181	0.190	**0.816**	0.064	0.052	0.091
Q9	-0.019	0.087	0.500	0.002	**0.754**	0.129	0.154
Q7	-0.059	0.089	0.144	0.118	**0.688**	0.072	0.050
Q11	-0.159	0.201	0.021	0.037	**0.659**	0.298	-0.179
Q13	-0.089	0.120	0.095	-0.005	0.095	**0.830**	0.146
Q14	-0.228	0.162	0.092	0.070	0.013	**0.776**	0.099
Q22	-0.069	0.127	0.098	-0.029	0.077	0.073	**0.793**
Q21	-0.080	0.117	0.072	0.153	0.007	0.146	**0.781**
Explained Variance (%)	**14.71**	**14.63**	**11.27**	**7.81**	**7.46**	**7.43**	**6.47**

Factor loadings higher than .6 were considered important.

CFA

The results of the CFA of the general model with 22 items in seven subscales showed that the model was accepted in its current form (the relative chi-square $(x^2/df)=2.34$ <3, $P<0.001$; RMSEA=0.057 >0.08, (95% CI = 0.050-0.064); CFI= 0.933 >0.9; IFI= 0.934 >0.9; TLI= 0.918 >0.9; GFI= 0.908 >0.9; AGFI= 0.891). Therefore, the CFA shows the adequacy of the model and the proper fit of its structural model for the study population. (Figure 3)

Reliability

Reliability was evaluated using the internal consistency. The Cronbach's alpha coefficient for the subscales ranged from 0.55 to 0.92. In addition, the ICC for the theory-based tobacco smoking beliefs questionnaire subscales was calculated, which ranged from 0.40-0.73 (acceptable) lending support to the stability of the questionnaire. Internal consistency of behavior comprised one item; therefore, internal consistency reliability was not calculated. The Cronbach's alpha and ICC of the theory-based tobacco smoking beliefs questionnaire subscales are shown in Table 4.
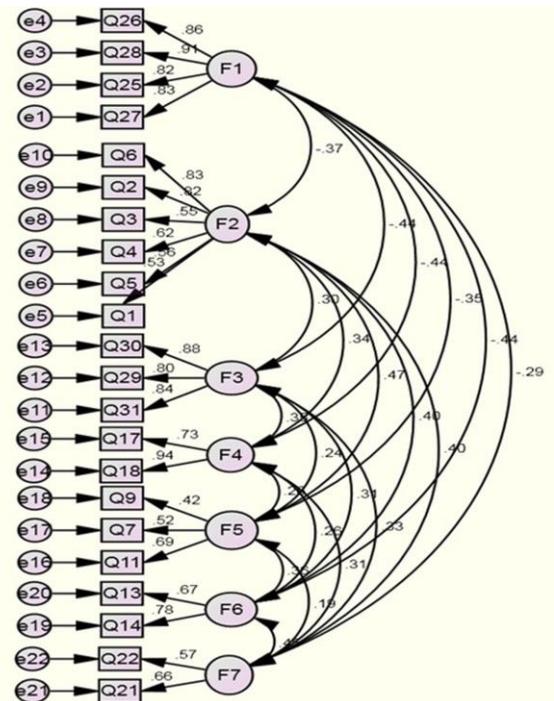
Figure 3: CFA of the belief-based tobacco smoking questionnaire with seven sub-scales (F1: Perceived power, F2: Behavioral beliefs, F3: Behavioral intention, F4: Motivation to comply, F5: Evaluation of behavioral outcomes, F6: Normative beliefs, F7: Control beliefs)

Table 4: Cronbach's alpha and ICC of the theory-based tobacco smoking beliefs questionnaire subscales

Variables	No of items	Cronbach's alpha	ICC*
Attitude			
Behavioral Beliefs	6	0.81	0.43
Evaluation of behavioral outcomes	3	0.65	0.41
Subjective Norms			
Normative beliefs	2	0.70	0.54
Motivation to comply	2	0.82	0.69
Perceived Behavioral Control			
Control beliefs	2	0.55	0.43
Perceived power	4	0.92	0.73
Behavioral Intention	3	0.88	0.71

*Intraclass Correlation Coefficient

Discussion

TPB generally provides a useful conceptual framework for dealing with the complexities of human social behavior.[15] The measurement of theoretical constructs is one of the most difficult and the most important parts in the study of the-ory-based health education. The measurement of the TPB constructs is possible by two methods: direct method in which, for example, the general attitude of people is measured towards certain behaviors and indirect (belief-based) method in which the specific behavioral beliefs and their consequences are evaluated.[15-16] In fact, indirect

measurement the TPB constructs focused on the cognitive dimensions of this theory. This theory assumes that people can have many ideas regarding any specific behaviors. TPB focuses on three types of beliefs that include behavioral, normative, and control beliefs.[15] By understanding cognitive behavioral beliefs, unique factors affecting the instigation or persuasion to perform certain behaviors are identified and affected in the intervention studies. In this study, the constructs of the TPB were evaluated by indirect method.

Validity

One of the key features of the questionnaires is the validity, which aims to determine the ability of an instrument to measure what it has been designed to measure. The most important step in determining the validity of a questionnaire is construct validation, especially in the psychometric issues. Factor analysis is the best method in this regard.[34] Primarily drafts of the study questionnaire consisted of 32 items. EFA conducted in this study was led to remove 10 items from the original questionnaire and the final form with 22 items was classified into seven subscales. EFA with Varimax rotation indicated that seven subscales including behavioral beliefs, Evaluation of behavioral outcomes, normative beliefs, motivation to comply, control beliefs, perceived power and behavioral intention could be extracted.

In this regard, Ajzen believes that any construct must be consisted of at least 3 items that by considering the fact, at least 12 items in direct measurement method and 21 items in indirect measurement method are needed.[16] The result of the present study in this section is consistent with the theoretical foundation and theoretical background of the TPB. On the other hand, the results of the analysis due to the KMO index indicate sufficient sample size and favorable factor analysis. In this study, the null hypothesis of data Sphericity was rejected and KMO statistic was confirmed. Seven factors identified in this study explained 69.7% of the variance and the highest expressed changes were related to the perceived power. In consistent with our findings, in the study of Karimi et al.[37] the theory explained 61% of vari-

ance of tobacco use that among the constructs of the theory attitude had the highest amount of explanation. The study of Ghazanfari et al.[38] also showed that the TPB explained 62% of the variance of physical activity and attitude explained the highest amount of variance.

Reliability

The reliability is referred to the consistency and stability of the constructs of an instrument that is indicative of the measurement accuracy of the questionnaire.[22] Results Cronbach's alpha coefficients between 0.55 and 0.92 for all subscales suggested that the provided questionnaire had acceptable reliability. Although one construct (control beliefs) had an undesirable level of Cronbach's alpha, other constructs had average and acceptable levels of Cronbach's alpha coefficient. However, there was no significant increase in the Cronbach's alpha coefficient when any items were removed. The study conducted by Bordewich et al.[39] in five European countries showed the internal consistency of the TPB from 0.52 to 0.89. In the study by Diamond[40] on American adolescents, an internal consistency of 0.76 was also reported for the constructs of the TPB. The internal consistency of the constructs of the TPB was reported between 0.54 and 0.82.[38] The low value of Cronbach's alpha coefficient in some constructs may be due to the low number of items in the constructs on one hand, and how to design the questionnaire, on the other hand. It is noteworthy that in this study the construct of control beliefs had 2 items, however Francis has emphasized on the existence of at least three items for each construct in the design manual of the TPB questionnaire.[16] Ajzen also believes that matching items with previous studies when designing the questionnaire provides a tool with a relatively low reliability which may underestimate the correlation between constructs of the theory.[15] It seems that increasing the number of items for some constructs can increase the reliability of the questionnaire, thus considering the point in future studies is recommended.

Although the present study has several strengths, it has a certain limitations. First, only male adolescents engaged in the study and it is not clear if we

included females in the study, we would obtain the same results. Second, current study was performed among a sample of student from Hamadan city to express their beliefs about tobacco smoking. Because of this, we cannot be sure that the conclusions apply to people in other geographic locations or at other facilities, therefore further studies may be required to approve the applicability of the belief-based tobacco smoking questionnaire as a totally accepted practical measure in Iranian society. Third, the Cronbach's alpha coefficients of some factors were not satisfactory. The future studies are needed to overcome these problems.

Conclusion

Overall, the questionnaire showed good construct validity and the majority of subscales showed high internal consistency reliability; therefore, the findings of the current study suggest that theory-based tobacco smoking beliefs questionnaire is a valid and reliable instrument for assessing beliefs of adolescents. The study findings support the Ajzen's TPB. In addition**,** further studies are recommended to understand the strengths and weakness of the questionnaire when it is used for other behaviors and in other settings.

Acknowledgments

Competing interests

The authors report no conflict of interest in the undertaking of this research**.**

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