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To cite this article: Asli Kalkim, Şafak Dağhan, Aynur Uysal Toraman & Deniz Eren (2018) Psychometric properties of the Turkish version: The Osteoporosis Smoking Health Belief Scale, *Journal of Substance Use*, 23:6, 610-617, DOI: [10.1080/14659891.2018.1466931](https://doi.org/10.1080/14659891.2018.1466931)

To link to this article: <https://doi.org/10.1080/14659891.2018.1466931>



Published online: 27 Apr 2018.



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Psychometric properties of the Turkish version: The Osteoporosis Smoking Health Belief Scale

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ABSTRACT

Background: Smoking-related health beliefs regarding osteoporosis may be of use to health professionals in helping those at risk of osteoporosis or those with osteoporosis to reduce or stop smoking. **Aims:** The aim of the study was to evaluate the psychometric properties of the Turkish version of the Osteoporosis Smoking Health Belief Scale (OSHBS). **Design and methods:** The methodological study sample consisted of 168 people. Cronbach alpha, Spearman–Brown, Guttman split-half method, item-total subscale correlation, and base and ceiling effects were used for reliability analysis. Validity was examined using content validity, construct validity, and contrasted group comparison. Construct validity was examined using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). **Results:** EFA revealed that three factors accounted for 67.36% of the explained variance. CFA validity testing supported the three-factor structure and the construct validity. The Cronbach's alpha coefficients were 0.91 for the benefit subscale, 0.87 for the barrier subscale, and 0.91 for self-efficacy. **Conclusion:** The scale was found to be a reliable and valid tool for determining the health beliefs of Turkish people concerning smoking in relation to osteoporosis. Health professionals can use the Turkish version of the OSHBS for research and evaluation of the health beliefs of Turkish people concerning smoking in relation to osteoporosis.

ARTICLE HISTORY

Received 13 November 2017
Revised 22 January 2018
Accepted 15 April 2018

KEYWORDS

Smoking; osteoporosis; reliability; validity

Introduction

Osteoporosis is a devastating disease affecting public health (International Osteoporosis Foundation, 2012a), in which changes in the microarchitecture of the bones and low bone density can lead to fractures (Tüzün, 2003). Today, it is estimated that more than 200 million people in the world have osteoporosis (Kutsal, 2009). In Turkey, it is known that more than 24,000 hip fractures occurred in 2010 in people aged 50 years or over, and that 73% of these fractures were in women (Tüzün et al., 2012).

Alongside factors that cannot be changed such as age, gender, and genetic characteristics, lifestyle-related factors which can be changed such as nutrition and exercise habits and the use of tobacco and alcohol also play an important role (Taşoğlu, Özdemir, & Kutsal, 2011). Smoking is associated with lower bone density and increased risk of experiencing a fracture (IOF, 2016).

Among the factors that can be changed, smoking has a significant effect on osteoporosis and the occurrence of fractures. In smokers, the absorption of calcium from the intestine is reduced, secondary hyperparathyroidism develops, and bone loss increases (Tüzün, 2003). Also, smoking reduces the production and use of estrogen, causing early menopause and thus osteoporosis (Biberoglu, 2005; IOF, 2012a; Yoon, Maalouf, & Sakhaee, 2012). In a meta-analysis examining 29 studies, strong evidence was obtained that smoking reduces bone mineral density (WHO, 2016). The IOF (2016) found that there was a correlation between smoking and low bone density and that it increased the risk of

fractures. Smoking increases the risk of fracture by 25%, and smokers have a history of hip fractures which is approximately twice as great as that of nonsmokers (Shahab, 2012). Despite the considerable damage that smoking does to the bones, most people are only aware that smoking harms cardiovascular health and increases cancer risk, and few are aware that smoking also endangers bone health (IOF, 2016). According to the WHO (2016), risks are lower in former smokers, suggesting that one benefit of quitting smoking is slowing the rate of bone loss.

In Turkey, the age of starting to smoke is low, smoking among young people is widespread, and the prevalence of smoking in women is increasing (Republic of Turkey Ministry of Health, 2008). In Turkey, 41.3% of males and 13% of females older than 15 years smoke. Examined by age group, the greatest proportion of male smokers are in the 25–34- and 35–44-year age group, with 53.1% and 50.9%, respectively. The greatest proportion of female smokers, 21.4%, is in the 35–44-year age group (Ertem & Çan, 2014). In the same report, it is seen that 12.9% of smokers intend to quit within the next 30 days, while 22.5% intend to quit in the next year. According to the results of the World Adult Tobacco Research (2012), the proportion of those in the 15–24-year age group who smoke daily or occasionally is 31.2% in males and 6.8% in females (Ertem & Çan, 2014). For this reason, advising smokers to stop smoking is of great importance from the point of view of osteoporosis (Shahab, 2012).

Theories can be used to explain the structural and psychological determinants of behavior and to guide the development

and refinement of health promotion and education (Painter, Borba, Hynes, Mays, & Glanz, 2008). The Health Belief Model (HBM) was developed to understand what motivated individuals to adopt protective behavior and how they translated them into action in order to preform health scans for early diagnosis and to keep their disease under control. The HBM has six constructs, namely perceived susceptibility, severity, beliefs, barriers, motivation, and self-efficacy (Gözüm & Çapık, 2014). This study focused on some constructs of the HBM, including perceived benefits, perceived barriers, and self-efficacy of individuals concerning smoking in relation to osteoporosis.

The HBM has been used in many studies, and many scales based on HBM have been developed to evaluate people's preventive behavior for illness. These scales have been adapted into Turkish. Among these are the Diabetes Health Belief Scale (Harris, Linn, & Skyler, 1987), the Breast Cancer and Screening Behavior Health Belief Scale (Champion & Scott, 1997), the Health Belief Model Scale for Cervical Cancer and the Pap Smear Test (Guvenc, Akyuz, & Acikel, 2011), and the Osteoporosis Health Belief Scale (Kim, Horan, Gendler, & Patel, 1991).

The Osteoporosis Smoking Health Belief Scale (OSHBS) is a practical scale based on HBM evaluating the behavior of individuals relating to quitting smoking, which is an important risk factor for osteoporosis. The scale consists of perceived benefits, perceived barriers, and self-efficacy subscales concerning smoking in relation to osteoporosis. Perceived benefits explain a person's views relating to the effects of recommended practices to reduce the risk, while perceived barriers explain a person's views relating to the costs of these recommended practices (Renuka & Pushpanjali, 2014). The self-efficacy construct shows an individual's belief relating to the ability to perform an action relating to a belief and the possibility of success of that action (Gözüm & Çapık, 2014). In the literature, there are HBM-based studies of smoking behaviors (Reisi et al., 2014; Renuka & Pushpanjali, 2014; Samira et al., 2017). These studies have found strong associations between constructs of HBM and smoking cessation (Renuka & Pushpanjali, 2014), a significant negative correlation between smoking behavior and self-efficacy to non-smoking (Samira et al., 2017) and between smoking behavior and perceived barriers, and a reduction in smoking behavior in individuals with high self-efficacy (Reisi et al., 2014). However, no studies were found in the literature that examined the health beliefs or self-efficacy of smoking cessation in relation to osteoporosis preventing behaviors. Also, there is no instrument to measure health beliefs concerning smoking in relation to osteoporosis in Turkey.

Method

Design

This methodological study was aimed at evaluating the psychometric properties of the Turkish version of the OSHBS (OSHBS-T).

Participants

The research was carried out at a shopping center in a city in the western region of Turkey between January and April

2016 with a target population determined by a nonprobability sampling method.

In instrument testing, experts recommend including 5–10 people for every item on the instrument (Aksayan & Gözüm, 2002). Additionally, at least five people per item are necessary to perform a factor analysis (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014). The sample to test the reliability and validity of the OSHBS-T consisted of 168 people, as it consisted of 18 items. For test–retest reliability, data were collected from a subsample of 30 participants with a 2-week interval. The inclusion criteria of the study were being 18 years old or older, being a smoker, being educated to at least primary school level, not having osteoporosis, and being willing to participate in this study.

Instruments

Data were collected in the study using a questionnaire. The questionnaire consisted of an individual identification form and the OSHBS-T.

The individual identification form: This was developed by the researchers and included five questions about age, gender, and education level as demographic data, and the number of cigarettes smoked per day and the length of time since beginning to smoke as smoking history (Doheny, Sedlak, Zeller, & Estok, 2010; Yoon et al., 2012).

OSHBS: The OSHBS was developed in 2010 by Doheny et al. and is an 18-item investigator-developed instrument to assess benefits, barriers, and self-efficacy related to smoking cessation. The 12 items making up the scale were adapted from two subscales (benefits and barriers) of the OSHBS evaluating health beliefs in relation to osteoporosis prevention behaviors developed by Kim et al. (1991). The other six items were adapted from the Osteoporosis Self-Efficacy Scale, developed by Horan, Kim, Gendler, Froman, and Patel (1998) to evaluate self-efficacy in relation to osteoporosis prevention behaviors.

The scale consisted of six items on barriers to giving up smoking (items 1, 2, 3, 4, 5, and 6), six on benefits (items 7, 8, 9, 10, 11, and 12), and six on self-efficacy (items 13, 14, 15, 16, 17, and 18). The Likert items were designed to measure benefits and barriers and are rated by the participant using a 5-point scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree). Items in the smoking instrument are parallel to those developed by Kim et al. (1991). For example, the item to measure the benefits of taking calcium was “taking in enough calcium prevents painful osteoporosis.” For the benefits of not smoking subscale, the item was rewritten as “not smoking prevents painful osteoporosis.” A parallel item written to assess barriers to smoking was derived from the item to assess barriers to calcium intake “in order to eat more calcium-rich foods you have to give up other foods that you like” was changed to “in order to stop smoking you have to give up an activity that brings you pleasure.” For the benefits and barriers subscales, the possible range of scores is from 6 to 30 for each one. The Self-Efficacy subscale evaluates the self-confidence of the individual in changing smoking behavior in relation to preventing osteoporosis. They are parallel to those developed by Horan et al. (1998) to address confidence regarding calcium intake and exercise to prevent osteoporosis. An example of an

exercise self-efficacy item is “put forth the effort required to exercise.” That item was rewritten to ask, “put forth the effort required to stop smoking.” Participants are asked to indicate how confident they are about changing smoking behaviors if recommended to do so within the following week by circling a number between 0 (not at all confident) and 10 (very confident). The possible range of scores is 0–60. The scale is evaluated not with the total scale score but with the total scores of each subscale. Cronbach’s alpha values of the original scale were 0.86–0.88 for the benefits subscale, 0.78–0.89 for the barriers subscale, and 0.94–0.96 for the self-efficacy subscale (Doheny et al., 2010).

Procedures

Language adaptation

The OSHBS was translated into Turkish by two independent bilingual language experts. Also, the items in the subscales of barriers, benefits, and self-efficacy in the Turkish adaptation by Kılıç and Erci (2004) of the OHBS developed by Kim et al. (1991) were examined. After it was translated into Turkish, the translated version was reviewed by the researchers. Then, a different language expert backtranslated it (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014). As a result of this final translation, “your chance” on the benefits subscale was corrected to “your risk,” and on the barriers subscale, “hard to do” was changed to “difficult to do,” and “everyday routine” was changed to “daily life.”

Content validity of OSHBS-T

Researchers recommend that at least three experts give their opinion to determine that the translation form is equivalent to the original form and calculate the content validity index (CVI) (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014). Eight experts (faculty members from the departments of public health, physical medicine, and rehabilitation and nursing) were asked to assess the appropriateness of the OSHBS-T items on a scale of 1–4 (1 = not appropriate at all, 4 = completely appropriate). Based on the relevant literature (Polit & Beck, 2006), ratings of 1 and 2 showed “invalid content,” while ratings of 3 and 4 showed “valid content.” Then, for each item, the item level CVI (I-CVI) was calculated as the number of experts giving a rating of 3 or 4 divided by the total number of experts. To calculate the scale level CVI (S-CVI), average proportions of items rated relevant by all the experts were calculated (Polit & Beck, 2006).

Pilot test

The translated version was piloted with 10 people who were not included in the study. Changes in wording recommended by these people were incorporated in the final version of the scale (Aksayan & Gözüm, 2002).

Ethical considerations

Permission was received by e-mail from Doheny and Sedlak to adapt the OSHBS to Turkish and to use it. Written approval was obtained from the Ethical Committee of the university faculty (IRB Approval no: 27344949/586-3438). The participants were given information about the study and were assured

of confidentiality. Written informed consents were obtained from all subjects before their participation in the study.

Data collection

The study data were collected by researchers from the participants by one-to-one interview and pen and paper technique. It took 5–10 min for the participants to complete the instruments.

Data analysis

Data were analyzed using SPSS 21.0 for Windows (SPSS Inc., Chicago, IL, USA). The CFA was calculated using LISREL version 8 (Scientific Software International, Inc., Lincolnwood, IL, USA). Sociodemographic data were analyzed using frequencies, means, and ranges as appropriate. Content validity was assessed using CVI.

Cronbach alpha, Spearman–Brown, Guttman split-half method, item-total subscale correlation, and base and ceiling effects were used for reliability analysis. The correlation between item-total subscale scores was examined using Pearson correlations analysis. Test–retest stability was assessed using Pearson correlations analysis and a dependent *t*-test. Validity was examined through content validity, construct validity, and contrasted group comparison. Construct validity was examined through exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). Kaiser–Meyer–Olkin (KMO) and Bartlett’s tests were used to analyze sampling adequacy for factor analysis. The Chi-square test (χ^2), degree of freedom (df), the ratio of df to χ^2 (χ^2/df), goodness of fit index (GFI), normed fit index (NFI), non-NFI (NNFI), comparative fit index (CFI), incremental fit index (IFI), and root mean square error of approximation (RMSEA) GFIs were assessed for this model. Skewness and kurtosis were used to assess the normality of the variables. The significance level was accepted as $p < 0.05$.

Results

Sample characteristics

The mean age of participants was 38.20 ± 9.62 years (min: 18, max: 76); 70.8% of the participants were females and 41.7% were university graduates. It was found that 44.1% of the participants smoked one or more packets of cigarettes a day and that mean daily cigarette consumption was 16.05 ± 9.0 . It was found that 50% of the participants had been smoking for 10 years or more (Table 1).

Validity analysis

To ensure content validity, eight experts were consulted, and I-CVI was determined to be 0.75–1.00. S-CVI was determined to be 0.88.

According to EFA for construct validity, the KMO coefficient was 0.854, which was shown to be significant at an advanced level on Bartlett’s test ($\chi^2 = 1854.342$, $p < 0.001$). Items were loaded on three factors which explained 67.36% of the total variance. The first, second, and third subscales were, respectively, 23.53%, 14.45%, and 29.38% of the total variance of the

Table 1. Sample characteristics.

| Characteristics | <i>n</i> | % |
|--------------------------------------|------------|--------------|
| Age | | |
| 18–30 | 25 | 20.8 |
| 31–44 | 86 | 51.2 |
| 45 and above | 47 | 28.0 |
| Sex | | |
| Women | 119 | 70.8 |
| Men | 49 | 29.2 |
| Education | | |
| Primary school | 21 | 12.5 |
| Middle school | 20 | 11.9 |
| High school | 57 | 33.9 |
| University | 70 | 41.7 |
| Number of cigarettes smoked in a day | | |
| Less than 10 cigarettes | 49 | 29.2 |
| 10–20 Cigarettes | 45 | 26.8 |
| 1 Package cigarettes and above | 74 | 44.1 |
| Smoking period | | |
| Less than 1 year | 8 | 4.8 |
| 1–5 years | 36 | 21.4 |
| 6–10 years | 40 | 23.8 |
| 10 years and above | 84 | 50.0 |
| Total | 168 | 100.0 |

OSHBS (Table 2). Factor loadings were found to be between 0.77 and 0.88 for the first subscale, between 0.57 and 0.86 for the second subscale, and between 0.77 and 0.86 for the third subscale (Table 2).

According to CFA for construct validity of a three subscale model, the factor loading in the first subscale (benefit) ranged from 0.72 to 0.84; it ranged from 0.60 to 0.78 in the second subscale (barrier), and from 0.69 to 0.86 in the third subscale (self-efficacy) (Figure 1). The model fit indicators were found to be GFI = 0.87, NFI = 0.93, NNFI = 0.97, CFI = 0.97, IFI = 0.97, $\chi^2 = 216.30$, $df = 128$, $p = 0.000$, and RMSEA = 0.064 (Figure 1).

Table 2. Factor loadings for the three extracted factor after varimax rotation.

| Items | Factor loading | | |
|---|----------------|----------|---------------|
| | Benefits | Barriers | Self-efficacy |
| Not smoking prevents problems from osteoporosis | 0.802 | | |
| You have lots to gain from not smoking to prevent osteoporosis | 0.832 | | |
| Not smoking prevents painful osteoporosis | 0.882 | | |
| You would not worry as much about osteoporosis if you did not smoke | 0.770 | | |
| Not smoking cuts down on your chance of broken bones | 0.815 | | |
| You feel better when you do not smoke to prevent osteoporosis | 0.831 | | |
| Not smoking makes you uncomfortable | | 0.769 | |
| You feel like you are not strong enough to not smoke | | 0.570 | |
| Not smoking means changing your life style which is hard to do | | 0.739 | |
| In order to stop smoking you have to give up an activity that brings you pleasure | | 0.811 | |
| Not smoking upsets your everyday routine | | 0.845 | |
| Not smoking makes you nervous and upset | | 0.855 | |
| Change your smoking habits | | | 0.830 |
| Decrease the number of cigarettes/cigars/pipes that you smoke | | | 0.806 |
| Put forth the effort required to stop smoking | | | 0.818 |
| Not smoke for a period of time | | | 0.867 |
| Stick to a program to decrease smoking even though it is difficult | | | 0.774 |
| Stop smoking | | | 0.781 |
| Explained variance (%) | 23.53 | 14.45 | 29.38 |
| Total explained variance (%) | 67.36 | | |
| Eigen value | 4.236 | 2.602 | 5.289 |

Reliability analysis

Reliability results are shown in Table 3. The Cronbach's alpha coefficients were 0.91 for the benefit subscale, 0.87 for the barrier subscale, and 0.91 for the self-efficacy subscale. Spearman–Brown coefficients for the benefit, barrier, and self-efficacy subscales were 0.75, 0.87, and 0.90. Guttman split-half coefficients for the benefit, barrier, and self-efficacy subscales were 0.85, 0.73, and 0.90.

The base and ceiling effects were 1.8% and 8.9% for the benefit subscale, 4.8% and 6% for the barrier subscale, and 0.6% and 4.8% for the self-efficacy subscale (Table 3). In the Hotelling's T^2 test (Hotelling's $T^2 = 322.843$, $F = 17.171$, $p = 0.000$), it was determined that the mean scores for the items were different.

The item subscale total score correlations were determined to be between 0.77 and 0.88 for the benefit subscale, 0.68 and 0.84 for the barrier subscale, and 0.80 and 0.87 for the self-efficacy subscale (Table 4).

No statistically significant difference was found between the mean scores of the scale and the subscales in the first and second administrations ($p > 0.05$, Table 5). The test–retest correlation coefficients were 0.975 for the benefit subscale, 0.980 for the barrier subscale, and 0.988 for the self-efficacy subscale. A positive relationship of high level significance was determined between the test–retest scores of the OSHBS and three subscales ($p < 0.001$, Table 5).

The negative correlation between the barriers and the self-efficacy latent variables was 0.36 (Figure 1).

Discussion

This study evaluated the psychometric properties of the Turkish version of the OSHBS. The results showed that the scale was able to measure the beliefs of Turkish people concerning smoking cessation in relation to osteoporosis correctly and consistently at different times.

Validity

Eight experts were consulted for content validity of the scale, and CVI value. An acceptable CVI score was one which was above 0.80 (Burns & Grove, 2009; Yurdugül, 2005). The experts suggested minor changes in wording and the translation was revised accordingly. Thus, some items (1, 2, 3, 6) that scored 0.75 were rearranged and reevaluated by the researchers. On the benefits subscale, “painful osteoporosis” was corrected to “pain caused by osteoporosis”, and “lots to gain” was changed to “a lot of benefits.” The experts determined that the revised scale was culturally appropriate.

When factor analysis is conducted, sample adequacy is a significant issue. Therefore, Bartlett's sphericity test and KMO were used. Bartlett's test must be statistically significant and the KMO value must be above 0.60 (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014). The results of the analyses in this study showed that the sample size and the data structure were appropriate for factor analysis.

The relationship of the items to the factors is explained by the factor loading value (Şencan, 2005). It has been reported

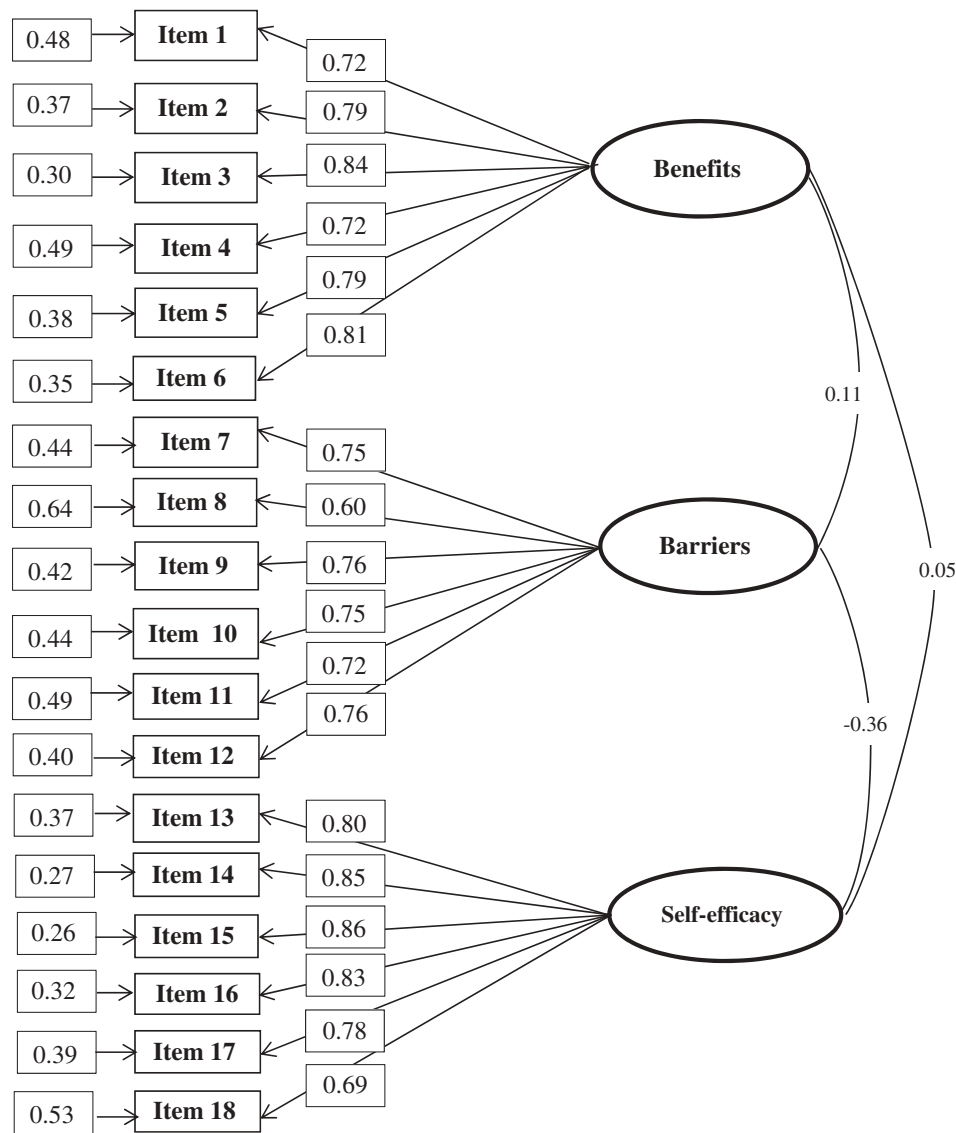


Figure 1. Confirmatory factor analysis of OSHBS.

Table 3. Reliability analysis of OSHBS-T subscale scores.

| Scale | Cronbach- α | Spearman-Brown | Guttman split-half | $M \pm SD$ | Min-Max | Base effect % | Ceiling effect % |
|---------------|--------------------|----------------|--------------------|-------------------|---------|---------------|------------------|
| Benefits | 0.906 | 0.747 | 0.854 | 20.45 \pm 6.14 | 6–30 | 1.8 | 8.9 |
| Barriers | 0.874 | 0.734 | 0.846 | 18.52 \pm 5.99 | 6–30 | 4.8 | 6.0 |
| Self-efficacy | 0.905 | 0.902 | 0.898 | 33.19 \pm 13.01 | 0–60 | 0.6 | 4.8 |

in the literature that factor loadings should be 0.30 and above (Şencan, 2005). The factor loadings of items in the scale were between 0.57 and 0.88. Therefore, we did not exclude any items from the original scale.

In this three-factor model, the total explained variance was 67.4%. The results of this study were found to be compatible with the results from the original scale (65.1% at time 1, 71.2% at time 2) (Doheny et al., 2010). The larger the percentage of explained variance, the stronger the factor structure becomes. According to studies in social sciences, explained variance ratios of 50–60% are commonly considered fairly high (Balci, 2011; Buyukozturk, 2012; Pagano, 2011). Hence, the total explained variance of OSHBS-T was considered satisfactory. According to our findings, OSHBS-T had adequate construct validity for the Turkish population.

The factor structure determined by the EFA was supported by the results of the CFA. CFA is used to show the relationship between the scale and its items. It is recommended that CFA be used to test the scales that develop in different cultures (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014; Vieira, 2011). All of the confirmatory factor loadings in all subscales of the scale were above 0.40 (Şencan, 2005). One model was development, in which the items were grouped into three factors (benefit, barrier, self-efficacy) that maintained the original conceptual model of the scale (Doheny et al., 2010). Several fit indicators (IFI, NFI, NNFI, and CFI) were higher than 0.90 and RMSEA was less than 0.08, indicative of a good model fit in this study (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014; Vieira, 2011). Fit indicators in

Table 4. Item-subscale and item test–retest correlations.

| Items | Item-subscale score correlation | Item test–retest correlation |
|------------------|---------------------------------|------------------------------|
| Benefits 01 | 0.814 | 0.907 |
| Benefits 02 | 0.834 | 0.877 |
| Benefits 03 | 0.884 | 0.902 |
| Benefits 04 | 0.772 | 0.966 |
| Benefits 05 | 0.812 | 0.988 |
| Benefits 06 | 0.830 | 0.980 |
| Barriers 07 | 0.780 | 0.967 |
| Barriers 08 | 0.682 | 0.926 |
| Barriers 09 | 0.795 | 0.953 |
| Barriers 10 | 0.786 | 0.933 |
| Barriers 11 | 0.817 | 0.972 |
| Barriers 12 | 0.843 | 0.999 |
| Self-efficacy 13 | 0.840 | 0.975 |
| Self-efficacy 14 | 0.797 | 0.960 |
| Self-efficacy 15 | 0.839 | 0.979 |
| Self-efficacy 16 | 0.868 | 0.983 |
| Self-efficacy 17 | 0.804 | 0.987 |
| Self-efficacy 18 | 0.802 | 0.985 |

this study were not compared with those from the original study because these results were not given in the Doheny et al. (2010) study.

Based on the data obtained, the factor structure of the Turkish version of the scale was similar to that of the original instrument. The factors identified in this study were covered well by the basic concepts of the original scale items by Doheny et al. (2010).

Reliability

Cronbach's alpha coefficient is a value that shows the correlation between responses of items. If there is a strong correlation between items, the Cronbach's alpha value will increase. Experts specify that the minimum acceptable value is 0.70 for Cronbach alpha, Spearman–Brown, and Gutmann split half values (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014; Kline, 2011; Polit & Beck, 2010). In this study, Cronbach's alpha, split-half, and Spearman–Brown values for the benefit, barrier, and self-efficacy subscales were found to be higher than 0.70. In the original scale study, Cronbach's alpha value for benefits was 0.86, for barriers it was 0.78, and for self-efficacy it was 0.94 at Time 1; at Time 2, these values were found to be 0.88, 0.89, and 0.96 (Doheny et al., 2010). Also, the results of this study were found to be compatible with those of the original scale (Doheny et al., 2010). The split-half correlation between the halves of the test was the first measure of internal consistency. The scale was divided into two equal parts, and the scores of the two halves were calculated (Polit & Beck, 2010). The split-half coefficient for subscales was found to be above 0.73.

Base effects were calculated as the percentage of participants who achieved the minimum possible scores and ceiling effects were calculated as the percentage of participants who achieved maximum possible scores (Terwee et al., 2007). Base or ceiling

effects are considered present if more than 15.0% of respondents achieve the lowest or the highest possible score, respectively. If base or ceiling effects are present, it is likely that extreme items are missing in the lower or upper end of the scale, indicating limited content validity. As a consequence, participants with the lowest or highest possible score cannot be distinguished from each other. Thus, reliability is reduced (Terwee et al., 2007). In this study, the base and ceiling effects were lower than 15.0%, which indicates a high level of reliability. The current study results show that the scale has good internal consistency for the Turkish population.

Hotelling's T^2 test revealed that the mean scores of the items were different. This indicated that the participants understood the items in the same way (Özdamar, 2002).

High correlation coefficients indicate a strong association between the item and the theoretical construct being measured and that the item can measure the intended construct effectively. The acceptable coefficient in item selection should be higher than 0.20 or 0.25 (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014). In the results of the present study, the item-subscale total score correlation coefficients were found to be positive and higher than 0.25. These correlation results showed that items had a strong correlation with the total score and had a good reliability level for the OSHBS-T.

According to the results of test–retest correlation, the OSHBS-T was found to have a high level of reliability and the results between the two administrations of the subscales were similar. The literature suggests that the acceptable minimum point for test–retest reliability is 0.70 (DeVellis, 2012; Hayran & Hayran, 2011; Johnson & Christensen, 2014; Kline, 2011). Therefore, the stability of the instrument over time was adequate for the Turkish version of the scale. In the original scale study, no significant change was found for benefits, barriers, and self-efficacy as a result of test–retest performed at an interval of 2 weeks (Doheny et al., 2010). In the light of the results of the analyses, the scale was found to be reliable.

Perceived barriers are characteristics of a treatment or preventive measure that may be seen as inconvenient, expensive, unpleasant, painful, or upsetting (Guvenc et al., 2011). For this reason, self-efficacy is expected to decrease as the perception of barriers increases. This was confirmed, as in the study on the original scale, when the barriers and self-efficacy subscales in this study were found to have a negative correlation.

Limitation

The small size of the sample is a limitation of the study. Others are that the sample was composed of individuals without a diagnosis of osteoporosis, and these data depended on the individuals' self-reporting.

Table 5. Comparison of OSHBS-T's subscales test–retest score means and correlations ($n = 30$).

| Scale | | First administration $M \pm SD$ | Second administration $M \pm SD$ | t^* | p | r | p |
|----------|---------------|------------------------------------|-------------------------------------|-------|-------|-------|-------|
| Subscale | Benefits | 19.80 \pm 5.82 | 19.90 \pm 5.37 | 0.414 | 0.682 | 0.975 | 0.000 |
| | Barriers | 22.66 \pm 5.92 | 22.56 \pm 5.68 | 0.462 | 0.647 | 0.980 | 0.000 |
| | Self-efficacy | 27.26 \pm 10.91 | 27.10 \pm 11.39 | 0.501 | 0.620 | 0.988 | 0.000 |

* t -Test in dependent groups.

Conclusion

The results of the study showed that the OSHBS-T, which consists of three subscales, is a valid and reliable instrument for determining the health beliefs (perceived barriers, benefits, and self-efficacy) of Turkish people concerning smoking in relation to osteoporosis. Health professionals can use the OSHBS-T for research and evaluation of the health beliefs of Turkish people concerning smoking in relation to osteoporosis. We recommend the use of the OSHBS-T for carrying out cross-cultural research on individuals at risk from osteoporosis and on osteoporosis patients, and before studies on smoking cessation in osteoporosis patients who smoke.

When considering the increase in life expectancy and the enlarging aged population, osteoporosis emerges as a significant public health concern. One of the important risk factors for osteoporosis is smoking. It is felt that the OSHBS-T scale can serve as a guide to health professionals when acting to stop or reduce smoking in those at risk of osteoporosis or osteoporosis patients.

Disclosure of potential conflicts of interest

The authors declare that they have no conflict of interest.

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