



Validity and Reliability of the Revised Dental Beliefs Survey in Iranian Young Adults



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ABSTRACT

Aims Negative views of dentists contribute to dental anxiety and reduced visits, worsening oral health. In Iran, where oral diseases are common and preventive care is low, understanding dental beliefs is essential. This study evaluated the psychometric properties of the Persian Dental Beliefs Survey-Revised to support dental health awareness and behavior change.

Instrument & Methods This cross-sectional psychometric study was conducted in 2024, involving 400 students at Saveh University of Medical Sciences, selected via convenience sampling. The original Dental Beliefs Survey-Revised was translated from English to Persian using the forward-backward translation method. Face and content validity were confirmed through qualitative assessment. Structural validity was examined using exploratory and confirmatory factor analyses. Internal consistency and reliability were measured by Cronbach's alpha, McDonald's omega, and Composite Reliability. Convergent and discriminant validity were assessed through average variance extracted, maximum shared variance, and Fornell-Larcker criteria. Statistical analyses were conducted using SPSS 21 and AMOS 18.

Findings The Persian Dental Beliefs Survey-Revised identified four factors (ethics (8 items), communication (6 items), control (4 items), and trust (6 items)) explaining 56.8% of the total variance. Goodness-of-fit indices from confirmatory factor analysis confirmed a satisfactory model fit. All reliability indices were strong, and both convergent and discriminant validity were found to be acceptable.

Conclusion The Persian version of the DBS-R demonstrates strong psychometric properties and is suitable for use in academic, clinical, and public health research within Persian-speaking populations.

Keywords Anxiety; Questionnaire; Psychometric; Oral Health; Young Adult

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Introduction

Oral health and hygiene are widely recognized as significant public health concerns in many countries worldwide. Although the World Health Organization (WHO) has highlighted the importance of oral health and its considerable impact on people's daily lives, the lack of focus on oral health and related diseases has had a detrimental effect on more than 5.3 billion people globally [1, 2]. Dental decay is the most common dental disease, affecting 60 to 90% of schoolchildren and 100% of adults worldwide. Additionally, nearly 30% of individuals aged 65 to 74 do not have their natural teeth [3]. According to a meta-analysis, the overall prevalence of dental decay among the Iranian population is 72.8% [4]. Research findings indicate that poor oral health and clinical indicators, such as decayed, missing, and filled teeth, are associated with irregular dental care [5, 6].

The presence and utilization of dental services in Iran are lower and more irregular than in other countries [6-8]. An important factor influencing the utilization of dental services in a community is the beliefs and perceptions about dentistry among different population groups [9]. Dental beliefs refer to patients' mental perceptions regarding dentists and dental treatment [10]. These beliefs reflect the patient's understanding of the behavior of dental health professionals, which influences their dental fear and anxiety. They also help in understanding the reasons for not using dental health services in a community [9]. Karibe *et al.* showed that negative beliefs about dentists are strongly associated with higher rates of frequent cancellations and missed appointments with dentists [11]. Additionally, negative behavior from dentists and staff, as well as a lack of trust, are essential factors that trigger anxiety and discourage people from visiting the dentist [12].

Beliefs about dentists were first reported through a questionnaire called the Dental Beliefs Survey (DBS), developed and evaluated by Milgrom [13]. The purpose of the DBS is to determine the extent to which a patient perceives the behavior of dental professionals as helpful in alleviating their fear or anxiety. The DBS questionnaire consists of 28 questions, designed in English, and includes three subscales: professionalism/ethics, communication, and control [14]. Subsequently, Kvale *et al.* analyzed the factorial structure of the DBS-R and noted that factor analysis of the data indicates the presence of a fourth dimension represented by the concept of Trust. This new domain includes items 4 and 10 (initially categorized under professionalism/ethics) and items 24-27 (originally placed in the control/lack of control domain) [15]. It has been suggested that the shorter version be used more often when researchers are interested in assessing trust in dentists [14].

The questionnaire has been examined in different cultures [11, 14, 16-18] and target groups, including patients [19], adults [14], and students [20]. Students

exhibit relatively similar characteristics but have diverse experiences [21]. They undergo behavioral changes and lifestyle variations, which may intersect with general health standards [22] and oral health [23]. Young adulthood is a critical period for shaping long-term health behaviors, including those related to oral health. Promoting positive oral health beliefs during this stage can lead to improved oral health outcomes and enhanced oral health-related quality of life [24]. For example, a study showed that students and younger individuals have a more negative attitude toward dentistry compared to other patients and dental visitors [16]. Furthermore, a study conducted among university students in southern Brazil indicated that 19.5% of students had not visited a dentist, and 53.5% reported delaying dental visits [25]. According to WHO estimates, personal lifestyle and health behaviors account for approximately 65% of overall health and quality of life [26]. These findings underscore the need for valid and reliable tools to assess oral health beliefs and behaviors in this age group. Given that universities provide direct access to this population, they represent a strategic setting for such assessments.

As far as we know, a scale for measuring beliefs regarding dentistry is currently not available in Persian. Such a scale would enable the assessment of attitudes and beliefs toward dentistry in a Persian-speaking population and would also be beneficial for cross-cultural studies. As nations strive to attain world-class educational standards and measure their progress against others, allowing individuals to take these assessments in their preferred languages becomes increasingly vital. This approach fosters fairness and ensures that language barriers do not obstruct the accurate evaluation of individuals' abilities [27]. This study aimed to translate and validate the 24-item Dental Beliefs Scale-Revised (DBS-R) to allow for a more accurate assessment of dental beliefs among university students in Iran. This work can serve as a foundation for future research and interventions to improve oral health and enhance dental care.

Instrument and Methods

Study design and sampling

This cross-sectional study involving 400 university students at Saveh University of Medical Sciences, Iran, examined the psychometric properties of the dental beliefs survey.

Participants were selected using a convenience sampling technique based on the inclusion criteria of having prior experience visiting a dentist and providing informed consent to participate in the study. Upon the recommendation of MacCallum *et al.*, we invited 400 individuals for our research, as they suggested a minimum sample size of 200 cases for psychometric studies [28]. This was necessary to ensure the availability of two separate samples to

assess structural validity. After a comprehensive explanation of the study's goals, participants were provided with questionnaires to complete. The researcher personally collected the questionnaires, explained the study, and invited individuals to participate voluntarily. Sampling and data collection for psychometric tests (factorial validity and reliability) were conducted between October 2023 and January 2024.

Research tools

The demographic characteristics, including marital status, age, and sex, and a history of toothache, were collected using a demographic data form.

This survey was initially developed in English. The DBS comprises 28 items categorized into three subscales. The professionalism/ethics subscale evaluates the dentist's technical competency and integrity [29]. The communication subscale assesses the quality of interaction between the dentist and the patient, as well as the dentist's demeanor. The lack of control subscale measures patients' perceived sense of control during dental appointments. The primary objective of this questionnaire is to provide insights into the patient-dentist relationship from the patient's perspective. In a study by Kvale *et al.*, a four-factor solution was proposed for categorizing specific attributes. The identified factors were ethics (8 items), communication (6 items), control (4 items), and trust (6 items) [15]. The trust subscale reflects the perception that the dentist may not empathize with the patient's experience of pain. We used the Kvale version [15] to adapt it for Iranians. Participants rated the items using a 5-point Likert-type scale, with scores ranging from 1 for "not at all" to 5 for "very much." The total scores ranged from 24 to 114, with higher scores indicating more negative perceptions or beliefs.

Procedure

The psychometric properties of the DBS-R were evaluated in translation, face and content validity examination, structural validity analysis, convergent and discriminant validity testing, and reliability assessment stages.

Translation

Beaton *et al.*'s guidelines [30] were followed to translate the English version of the DBS-R into Persian. Initially, two experts, one in psychology and the other in Persian, independently translated the questionnaire. Subsequently, the translators and the primary researcher compared the translations, resolved any discrepancies, and synthesized the Persian version. The next step involved back-translating the questionnaire by a native English speaker who was unaware of the original version. An expert committee, consisting of all translators and the primary researcher, reviewed and approved the final Persian version after addressing any disparities.

Content and face validity

The necessity for quantitative evaluations of content and face validity of standard questionnaires was

considered unnecessary [27]. Therefore, only qualitative methods were employed to assess face and content validity. Twenty participants who met the inclusion criteria completed the questionnaire and provided feedback on item clarity, relevance, and difficulty. All participants reported that the items were clear and easy to understand. In the next step, ten experts in dentistry, public health, psychology, and epidemiology were invited to review the questionnaire in terms of grammar, wording, item allocation, and scaling. Based on their constructive feedback, several items were revised to improve the overall quality of the instrument.

Structural validity

Structural validity assessment involved applying exploratory factor analysis (EFA) followed by confirmatory factor analysis (CFA) [31]. Establishing the optimal sample size for factor analysis can be complex. Following the recommendation by MacCallum *et al.*, which suggested a minimum sample size of 200 individuals for psychometric studies [28], the suitability of the data for factor analysis in EFA was evaluated using the Kaiser-Meyer-Olkin (KMO) criterion and Bartlett's sphericity test [32-34]. Maximum likelihood with Promax rotation was utilized to extract factors. The number of factors was determined based on the literature supporting four factors and the Eigenvalue >1 criterion. Our analysis established a minimum factor loading of 0.4 as the threshold for factor extraction. First- and second-order factor analyses based on the maximum likelihood approach were employed to estimate the fit indices pattern.

The model fit was assessed according to the root mean square error of approximation (RMSEA), normed fit index (NFI), comparative fit index (CFI), goodness of fit index (GFI), chi-square (χ^2) value, incremental fit index (IFI), Tucker-Lewis index (TLI), and χ^2 /df index. CFI, GFI, NFI, TLI, and IFI values greater than 0.90, along with RMSEA values less than or equal to 0.08 and χ^2 /df values less than or equal to 3, indicated a good model fit [35]. In the second-order factor analysis, researchers assumed that the latent parameters identified earlier were present. The original dataset consisted of 400 participants, randomly divided into two separate EFA and CFA datasets; each 200 participants.

Convergent and discriminant validity

The evaluation of the DBS-R involved an assessment of its convergent and discriminant validity. Convergent validity was confirmed using the average variance extracted (AVE) values. Additionally, discriminant validity was established by examining maximum shared variance (MSV) and average shared variance (ASV), as well as using Fornell and Larcker's method [36].

Reliability assessment

The internal consistency and construct reliability were assessed using Cronbach's alpha, McDonald's omega, and composite reliability methods [37, 38].

Data analysis

Various statistical measures were employed in the data analysis to evaluate normal distribution, outliers, and missing data. Skewness and kurtosis were used to assess univariate and multivariate data distributions separately. Furthermore, the Mardia coefficient of multivariate kurtosis was applied to examine multivariate normality, while Mahalanobis D-squared was employed to detect multivariate outliers in SPSS 21 and AMOS 18 software.

Findings

The mean age of the students was 22.23±4.96 years. The majority of participants were single (n=356, 89.4%). Additionally, 30% had experienced tooth extraction, 64.3% had at least one filled tooth, and 53% had a decayed tooth.

Maximum likelihood exploratory factor analysis

All items followed a normal distribution. Moreover,

the Mardia coefficient of multivariate kurtosis was below 8. Additionally, no significant multivariate outliers were detected based on the Mahalanobis D-squared test (p<0.001). MLEFA with Promax rotation and Kaiser normalization was conducted on the first random dataset (n=200). The KMO measure of sampling adequacy was 0.91. Bartlett's test of sphericity was also significant ($\chi^2=3774.59$; df=276; p<0.001). The four-factor solution explained 56.8% of the total variance.

Confirmatory factor analysis

The four factors, which were subsequently examined through CFA across three models. Model 1 initially assumed a single latent factor; however, it did not exhibit an acceptable fit with the observed indicators. Model 2 was then tested, incorporating four latent factors. A second-order factor analysis was conducted to determine whether all the identified factors aligned with the overarching construct of "Dental Beliefs" (Figures 1).

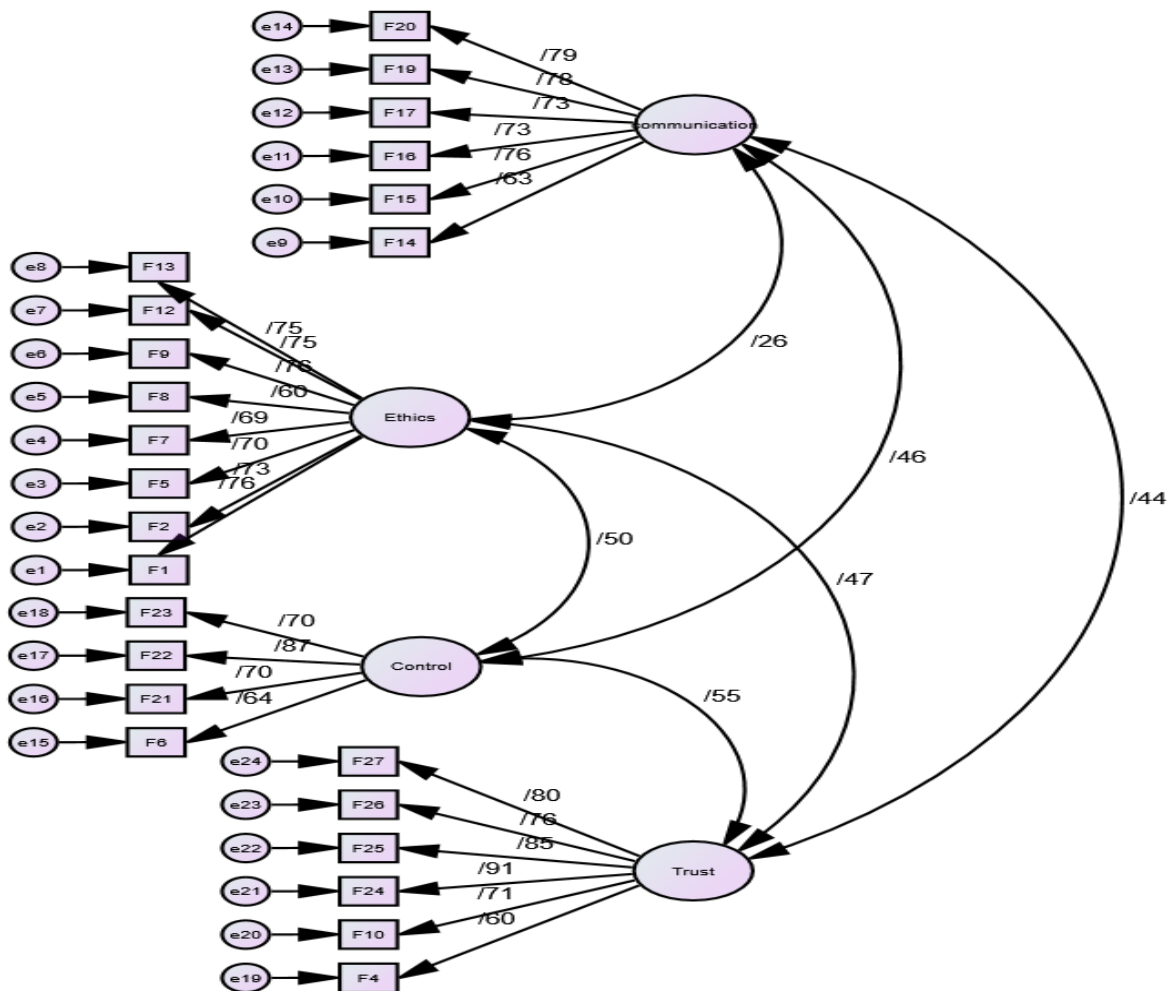


Figure 1. Factor structure model of the Revised Dental Beliefs Survey (DBS-R) based on confirmatory factor analysis (CFA)

All factor loadings of the latent parameters were statistically significant at the 99% confidence level. The model exhibited acceptable goodness-of-fit. The chi-square to degrees of freedom ratio (χ^2/df) was

2.11 (p<0.001); both the TLI and the CFI exceeded 0.9, and the RMSEA was 0.06. Collectively, these indices validated the model's overall adequacy and supported its construct validity (Table 1).

Table 1. The model fit indicators (χ^2/df : Chi-Squared Test/Degree of Freedom; NFI: Normed Fit Index; RMSEA: Root-Mean-Square Error of Approximation; GFI: Goodness of Fit Index, AGFI: Adjusted Goodness of Fit Index; IFI: Incremental Fit Index; CFI: Comparative Fit Index;; TLI: Tucker-Lewis index) of the revised dental beliefs survey

Model	χ^2/df	NFI	RMSEA	GFI	AGFI	IFI	CFI	TLI
1	6.60	0.51	0.14	0.56	0.47	0.62	0.61	0.57
2 (First-order)	2.11	0.77	0.06	0.86	0.83	0.92	0.92	0.91
3 (Second-order)	2.12	0.77	0.06	0.86	0.83	0.92	0.92	0.91

Convergent and discriminant validity

The total mean score of the DBS-R was 68.55±21.08. Regarding the subscales, the mean scores were as follows: trust=13.73±6.29, ethics=18.78±7.17, communication=13.38±5.22, and control= 0.89±3.56. There were robust convergent validity for all four

factors. The correlation coefficients among the factors were lower than the square roots of the AVE values, which further substantiated the acceptable level of discriminant validity. Cronbach’s alpha and McDonald’s omega values for ethics, communication, control, and trust were all high (Table 2).

Table 2. Validity (AVE: Average Variance Extracted; MSV: Maximum Shared Squared Variance; ASV: Average Shared Variance) and reliability (α : Cronbach’s alpha; Ω : McDonald’s omega; CR: Composite Reliability) analysis of the Revised Dental Beliefs Survey structure

Factors	Items	Factor loading	α	Ω	CR	MSV	AVE	ASV
Ethics	I am concerned that dentists recommend work that is not needed	0.75	0.89	0.89	0.89	0.24	0.51	0.17
	I believe dentists say/do things to withhold information from me	0.73						
	I am concerned that dentists do not provide all the information I need to make good decisions	0.69						
	I’ve had dentists seem reluctant to correct work unsatisfactory to me	0.68						
	When a dentist seems in a hurry, I worry that I’m not getting good care	0.60						
	I am concerned that the dentist is not looking out for my best interests	0.75						
	I feel dentists do not provide clear explanations	0.74						
	I am concerned that dentists do not like to take the time to talk to patients	0.75						
Communication	I feel uncomfortable asking questions	0.63	0.89	0.89	0.87	0.20	0.54	0.45
	Dental professionals say things to make me feel guilty about the way I care for my teeth	0.76						
	I am concerned that dentists will not take my worries (fears) about dentistry seriously	0.73						
	I am concerned that dentists will put me down (make light of my fears)	0.72						
	I am concerned that dental personnel will embarrass me over the condition of my teeth	0.77						
	I believe that dentists don’t have enough empathy for what it is really like to be a patient	0.79						
Control	Dentists don’t seem to care that patients sometimes need rest	0.64	0.80	0.81	0.82	0.30	0.53	0.25
	When I am in the chair, I don’t feel like I can stop the appointment for a rest if I feel the need	0.69						
	Dentists don’t seem to notice that patients sometimes need rest	0.86						
	Once I am in the chair, I feel helpless (that things are out of my control)	0.69						
Trust	I have had dentists say one thing and do another	0.60	0.87	0.87	0.90	0.30	0.60	0.23
	Dentists focus too much on getting the job done and not enough on the patient’s comfort	0.71						
	If I were to indicate that it hurts, I think that the dentist would be reluctant to stop and try to correct the problem	0.91						
	I have had dentists not believe me when I said I felt pain	0.85						
	Dentists often seem in a hurry, so I feel rushed	0.76						
	I am concerned that the dentist will do what he wants and not listen to me while I’m in the chair	0.80						

Discussion

The present study aimed to translate and evaluate the psychometric properties of the Persian version of the DBS-R in Iranian university students.

The Persian version demonstrated four different constructs. Four factors explained 56.80% of the variance based on the exploratory factor analysis. All aspects were loaded appropriately based on their respective factors. According to the original study by Kvale *et al.* [15], these four factors explain 63.9% of the variance. According to the CFA, five models were investigated, and the 24-item version with four domains improved upon the original. Furthermore, a global factor that included all of these items was identified. Following the original study, we

conducted CFA in three models. In Model 1, the DBS-R was considered one global factor; however, we did not find acceptable fit indicators. We then tested the model at two levels; one with four domains and another with the DBS-R as one domain. Both of these models demonstrated acceptable values. Convergent and discriminant validity were satisfied, as indicated by AVE values greater than 0.5 and CR values exceeding the AVE during the assessment.

The Fornell-Larcker test confirmed the discriminant validity of the Persian version, which was a significant validation. This finding aligns with the study by Kvale *et al.*, which found strong convergent validity between DBS-R scores and related constructs, such as dental anxiety and desire for

control. They also reported strong discriminant validity by comparing DBS-R scores between a clinical sample of individuals with injection phobia and a non-clinical sample of students [15]. All reliability indices, such as Cronbach's alpha and CR, were excellent for these four subscales, further reinforcing the robustness of the Persian version. The reliability of the scales in Kvale *et al.*'s study ranged from 0.88 to 0.90. Furthermore, Milgrom examined the psychometric properties of the DBS-R among students and patients with dental phobia. Their findings showed strong convergent validity with moderate correlations between this questionnaire and dental anxiety measures, consistent with expectations [20].

Different versions of the DBS-R, consisting of 22, 24, 25, and 28 items, have previously been psychometrically evaluated in Spain, Turkey, China, and Sweden. In the Swedish version, 550 adults were compared, including students, general dental patients, 105 periodontal patients, and 62 patients on a waiting list for dental fear treatment. According to the results, the DBS-R exhibited strong internal consistency across all study groups. The findings indicate that the DBS-R is a trustworthy and valid measure for evaluating attitudes toward dentists within diverse Swedish patient and non-clinical groups [16].

In another study by Balgiu *et al.*, EFA and CFA revealed a four-factor model with dimensions of professionalism, comfort, communication, and not feeling involved ($\chi^2/df=2.02$; CFI=0.91; RMSEA=0.072). Cronbach's alpha for the subscales ranged from 0.90 to 0.63. Test-retest reliability for the total score was considered acceptable ($r=0.63$). Correlations between the DBS-R, DASS-21R, and DFS were positive but moderate, indicating good convergent validity [19].

The findings from the Turkish version, based on EFA, indicated that the DBS-R comprises three factors encompassing 22 items. Upon conducting a CFA, it was determined that the 22-item three-factor version demonstrated a better fit for the data than the original 28-item English language four-factor structure model proposed. The internal reliability of the Turkish version of the DBS-R was substantiated by a Cronbach's alpha value of 0.88. Furthermore, the correlation coefficient between the Turkish version of the DBS-R and the Modified Dental Anxiety Scale (MDAS) was observed to be 0.29 [18].

The psychometric properties of the short and long Chinese versions of the DBS-R exhibit similar results. Both versions demonstrate good reliability and validity. The internal consistency in both versions is high (0.93-0.94), with alpha levels matching those found in studies involving clinical and non-clinical samples [16, 17, 20]. Moreover, all subscales exhibit internal consistency. Test-retest data revealed that the CDBS-R remains stable over two weeks. The findings for the Chinese version suggest that the

items on the CDBS-R measure a single underlying construct that remains stable outside the dental setting [14]. Additionally, in the Spanish version, the internal reliability is 0.96 (95% CI=0.94-0.97), and the test-retest reliability is 0.86 (95% CI=0.64-0.94) [17].

Regarding factor averages in the Persian version, ethics, trust, communication, and control had the highest to lowest averages, respectively. In the 24-item Chinese version, the averages correspond to ethics, communication, trust, and power in that order [14]. Based on our averages, the highest negative attitude toward the target group was found in the ethics factor among the subscales. Our results are similar to those of Wu & Buchanan [14]. These observations indicate that Iranian students strongly emphasize ethics in their perceptions of dentistry. This finding is significant as it highlights the importance of instilling ethical principles and values in future dental professionals. Patients' concerns about the moral behavior of dental professionals played a crucial role in shaping their overall understanding of healthcare experiences. The items in the ethics factor, primarily "I am concerned that dentists may recommend procedures that are not necessary" and "I am concerned that dentists may not provide me with all the necessary information for good decision-making," highlighted fundamental aspects of trust. Transparency in the dentist-patient relationship and the fear that dentists may recommend unnecessary procedures underscore the core of patients' trust in healthcare providers.

This indicates concerns about potential overtreatment or the exploitation of patients for financial gain. Such worries impact the economic well-being of patients and erode their trust in dentists' professional judgment and honesty. Similarly, concerns about dentists withholding necessary information for informed decision-making emphasize the importance of transparency and patient autonomy in healthcare delivery. Patients expect clear and comprehensive explanations about treatment options, potential risks, and choices. When they perceive a lack of transparency or feel that information is being withheld, it can lead to feelings of vulnerability and weaken their trust in the treatment process [19]. In the studies by Kuhl *et al.* [15, 16], as well as in the Turkish-translated version [18], control had the highest mean; however, in our study, control had the lowest mean. The ability to control conditions can play a determining role in individuals' anxiety regarding treatment [39, 40].

Based on the tell-show-do model, which is a behavior-shaping technique that enhances predictability in the clinical setting [41], behavioral control can be increased among patients. Behavioral control allows patients to feel that they have some control over the treatment process. This sense of control also increases trust in the dentist [40]. The average communication structure was 38.13,

compared to 7.73 in Turkish and 19 in Chinese. A good relationship between patient and physician is crucial for managing anxiety. Dentists can establish a good relationship with patients and increase trust by providing comprehensive information about the problem description, treatment options, and preventive measures [42].

Our study's strengths include examining the psychometric properties of the DBS-R scale for the first time in Iran, utilizing the forward-backward method according to the Beaton protocol for the translation process, and achieving convergent and discriminant validity. However, the present study also had some limitations that need to be acknowledged. First, there was potential bias due to a tendency to provide desired responses with self-reported measures, and the study did not assess test-retest reliability.

The Persian version of the DBS-R has appropriate psychometric properties for evaluating beliefs and attitudes toward dentists among Iranian young people. This suggests that healthcare providers can use it for potential implications in developing effective oral health interventions focused on health beliefs, which refer to individuals' perceptions of their well-being, including their views on health, factors influencing illness, and strategies for disease prevention and recovery. Furthermore, health policymakers should pay special attention to beliefs, particularly among the young. A study showed that students have more critical attitudes and higher expectations regarding dental services than other age groups, such as adults and patients. In other studies, it is recommended that the tool's validity be investigated among patients and individuals with dental phobias to compare results across different groups and obtain the best version. In the current study, a 24-item version has been validated; researchers can validate a 28-item version in Persian and compare it with the current version.

Conclusion

The research findings indicate that the Persian version of the DBS-R has appropriate psychometric properties for evaluating beliefs and attitudes toward dentists among Iranian young people.

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