



Farsi Translation and Cultural Adaptation of Psychosocial Impact of Dental Esthetics Questionnaire and Evaluation of its Validity and Reproducibility

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Abstract

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AIMS: This study aimed to translate the psychosocial impact of dental esthetics questionnaire (PIDAQ) to Farsi and assess its cultural adaptation, validity, and reproducibility.

MATERIALS AND METHODS: The PIDAQ was translated to Farsi by experts fluent in Farsi and English. It was then back-translated to English by another expert blinded to the original version. The translated version was administered among 40 patients to assess its face validity and content validity. Final version of the questionnaire along with the index of orthodontic treatment need (IOTN) and the perception of occlusion scale (POS) was administered among 400 patients (224 females, 176 males) to assess their need for orthodontic treatment. To assess its validity, the mean score of PIDAQ was evaluated in different ranges of IOTN-esthetic component (IOTN-AC), IOTN-dental health component (DHC), and POS. To assess its convergent validity, the PIDAQ, IOTN-AC, IOTN-DHC, and POS scores were evaluated. Its construct validity was evaluated by confirmatory and exploratory factor analysis. Its internal consistency was evaluated using Cronbach's alpha and the split-half method. Its test-retest reliability was evaluated by calculating the intraclass correlation coefficient (ICC).

RESULTS: The Cronbach's alpha was found to be 0.900–0.945 for the questionnaire domains, which showed good reliability. The ICC for the four questionnaire domains was 0.926, which was excellent. IOTN-DHC, IOTN-AC, and POS had significant correlations with the questionnaire domains.

CONCLUSIONS: The Farsi version of PIDAQ has optimal validity and reliability and can be used for assessment of the dental esthetics-related quality of life of Iranian young adults.

Introduction

Malocclusion not only affects the masticatory function and facial esthetics but also negatively impacts on the psychological and mental well-being of individuals [1]. One's perception of dental esthetics plays a fundamental role in his/her quality of life [2], [3]. It can also affect the individual's self-image, self-respect, and personality integrity [4], [5], [6], [7]. The effects of malocclusion on patients' perception of themselves and their quality of life have been previously investigated [8], [9], [10]. Several tools are available to assess the esthetic aspects of malocclusion and are commonly used for this purpose [3], [8], [11], [12].

Patients demand orthodontic treatment to improve their dentofacial appearance and the related psychological factors [8], [13], [14], [15], [16], [17], [18], [19], [20], [21]. The psychosocial impact of dental esthetics questionnaire (PIDAQ) is a specific tool designed for assessment of the need for orthodontic treatment and evaluation of the quality of life related to dental esthetics. This questionnaire was designed by Klages *et al.*, [20] in English for young adults. PIDAQ can differentiate the degree of one's self-assessment of dental esthetics using the esthetic component (AC) of the index of orthodontic treatment need (IOTN) and the perception of occlusion scale (POS) [17]. PIDAQ is a psychometric instrument with 23 items in four domains of dental self-confidence (DSC) with 6 items, social impact (SI) with 8 items, psychological

impact (PI) with 6 items, and esthetic concern (AC) with 3 items. The respondents respond to the questions by choosing a number from 0 to 4 [20]. This questionnaire has been translated to Italian, Spanish, Chinese, Brazilian, Indian, Croatian, and Moroccan languages [1], [17], [20], [22], [23], [24], [25], [26].

The majority of questionnaires related to self-perception and oral health such as PIDAQ have been designed in English-language countries. Thus, they need to be translated before use in other countries. Cultural adaptation and validation should also be performed while maintaining the psychometric properties of the questionnaires [1].

Considering the fact that PIDAQ has not been translated to Farsi before, this study aimed to translate the PIDAQ to Farsi and assess its cultural adaptation, validity, and reproducibility.

Subjects and Methods

In this cross-sectional study, the study population comprised students attending the Kermanshah University of Medical Sciences. Subjects were selected randomly. According to Norusis [27], minimum sample size for studies that require factor analysis is 300 individuals. On the other hand, according to Nunnally [28], ten individuals were required for each item of the questionnaire. Thus, the minimum sample size was calculated to be 230 individuals. To ensure accuracy, 400 students were enrolled in this study.

Translation and cultural adaptation

The English questionnaire was first translated to Farsi by experts in the field, who were fluent in both English and Farsi through a group discussion. The Farsi version was then back-translated to English by an expert blinded to the original English version of the questionnaire. The English translation was then evaluated and compared with the original English questionnaire. Necessary modifications were made in the first Farsi version accordingly.

Pilot study

To assess the face validity and content validity of the questionnaire, the Farsi version of the questionnaire was administered among 40 patients who met the inclusion criteria. Next, the participants were requested to express their opinion about the content of the questionnaire and possible unclear items. The following questions were asked from the participants: (I) What is your perception of each question? (II) Can you repeat the question in your own words? (III) Please

mention any unclear term or specific words that seem insulting or offensive to you, and (IV) what is your preferred term for the items with multiple alternative terms?

Face validity and content validity were determined by group discussion and a pilot study. The final version of the questionnaire was prepared as such.

Calibration of students

Main study: The final version of PIDAQ along with IOTN and POS was administered among the target population of 400 students. The orthodontic treatment need was determined in the participants accordingly. The participants were randomly selected among students attending the Kermanshah University of Medical Sciences and included 224 females and 176 males. The IOTN-AC included ten photographs showing different degrees of malocclusion. The participants were requested to choose the photograph that best showed their dentition. According to the IOTN-dental health component (DHC) score, the samples were divided into five grades (Grade 1: No need for orthodontic treatment and Grade 5: Severe need for orthodontic treatment).

POS, which is a self-reported scale, is composed of six sentences about the characteristics, and leveling and alignment of the anterior teeth, which are asked from participants.

Assessment of psychometric properties

Criterion validity, convergent validity, and construct validity were calculated to assess the validity of the questionnaire. For assessment of criterion validity, the mean score of PIDAQ in different ranges of IOTN-AC, IOTN-DHC, and POS scores was evaluated. To assess the convergent validity, the correlation coefficient of PIDAQ score with IOTN-AC, IOTN-DHC, and POS scores was calculated. The construct validity was calculated using the confirmatory factor analysis and the exploratory factor analysis. To assess the reliability of the questionnaire, its internal consistency and test-retest reliability were calculated. Its internal consistency was calculated using Cronbach's alpha and the split-half method. To assess its test-retest reliability, 75 subjects that had previously filled out the questionnaire filled it out again, and test-retest reliability was determined by calculating the intraclass correlation coefficient (ICC).

Exclusion criteria

The exclusion criteria were physical or mental disability preventing completion of the questionnaire, previous orthodontic treatment, presence of cavitated or broken teeth, and the presence of black spots in the anterior teeth.

Statistical analysis

Normal distribution of data was evaluated using the Kolmogorov-Smirnov test. To enhance analysis and interpretation of results, the inverse of DSC variable was used in some analyses (R.DSC). To assess the construct validity, the exploratory factor analysis and the confirmatory factor analysis were used. In exploratory factor analysis, the principal axis factoring and the equamax method were used. The Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) was used to assess the adequacy of sample size. To assess the difference in the correlation matrix of the questions, Bartlett's test of sphericity was applied. The Chi-square test, the relative Chi-square, the goodness of fit index, the comparative fit index, the incremental fit index, the Tucker-Lewis coefficient, the root mean square error of approximation, the root mean square residual, and the Akaike information criterion were used to assess the confirmatory factor analysis. The criterion validity was calculated by comparing the mean scores of PIDAQ based on the IOTN-AC, IOTN-DHC, and POS scores using ANOVA and Tukey's *post-hoc* test.

The internal consistency of the questionnaire was determined using Cronbach's alpha. The reproducibility was assessed by test-retest reliability and calculation of ICC, standard measurement error, and limits of agreement on 75 participants who filled out the questionnaire twice with a 2-week interval.

Data were analyzed using SPSS version 18 (SPSS Inc., IL, USA), AMOS, and R version 3.2.2 with BLANDR package. The level of significance was set at 0.05.

Results

Cultural adaptation

The pre-test of the translated version of the questionnaire revealed that the Iranian young adults had no problem in perception and retelling of the questions of the questionnaire; thus, the cultural adaptation of the questionnaire was confirmed.

Validity

Exploratory factor analysis: The explanatory factor analysis, similar to the original instrument, detected four factors. The KMO was found to be 0.949, which confirmed an adequate sample size. The Bartlett's test revealed that the correlation matrix was not homogenous ($p < 0.001$). In other words, adequate correlation in data matrix was present for factor analysis. Four factors with Eigenvalues >0.8 were extracted. The Eigenvalues of the first and fourth factors were 12.193 and 0.856, respectively. The first factor determined

51.707% of the variance of the variables and the sum of all four factors determined 68.082% of the variance of the variables. The rotation matrix revealed that 0.842% of the variance of DSC3 and 0.707% of the variance of R.DSC2 were determined by the first factor. All items were entered into the factor analysis of the original questionnaire.

Confirmatory factor analysis

A significant correlation was noted between all questionnaire domains and latent factors, and all weights were significant ($p < 0.001$). Thus, no item had to be removed. The weight of R.DSC latent factor on R.DSC1 was 0.903. In other words, R.DSC latent factor determined around 0.815% of the variance of R.DSC. Furthermore, all standard weights had acceptable values. Table 1 shows the indices used for the assessment of the four-factor confirmatory analysis.

Table 1: Indices used for the four-factor confirmatory analysis

CMIN	DF	CMIN/DF	GFI	CFI	IFI	TLI	RMSEA	RMR	AIC
612.019	209	2.928	0.882	0.950	0.950	0.939	0.070	0.061	746.019

AIC: Akaike information criterion, RMSEA: Root mean square error of approximation, RMR: Root mean square residual, CFI: Confirmatory factor analysis, TLI: Tukey-Lewis index.

Criterion validity

Table 2 shows the results of the comparison of PIDAQ domains based on IOTN-AC scores and the Spearman's correlation coefficient for the correlation between PIDAQ and IOTN-AC scores. According to the IOTN-AC scores, the participants were divided into four groups. The mean scores of PIDAQ domains showed significant differences regarding IOTN-AC scores. Furthermore, significant correlations were noted between IOTN-AC score and the scores of the questionnaire domains (Table 2). Table 3 compares the PIDAQ domains based on IOTN-DHC scores and the Spearman's correlation coefficient between the scores of PIDAQ domains and IOTN-DHC. According to the IOTN-DHC scores, the participants were divided into four groups. The mean scores of PIDAQ domains had significant differences regarding IOTN-DHC scores. Furthermore, a significant correlation was noted between IOTN-DHC score and the scores of the questionnaire domains (Table 3).

Table 2: Comparison of the scores of PIDAQ domains based on IOTN-AC score and the Spearman correlation coefficient for the correlation between PIDAQ domains and IOTN-AC scores

IOTN-AC Score	R.DSC***		SI***		PI***		AC***	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1 (n=158)	7.92 ^a	4.87	6.32 ^a	5.04	5.58 ^a	4.68	1.48 ^a	2.13
2 (n=142)	12.27 ^b	4.95	9.35 ^b	6.28	8.28 ^b	5.26	3.57 ^b	2.96
3 (n=68)	15.91 ^c	4.54	11.96 ^{bc}	7.25	11.34 ^c	6.14	4.84 ^c	3.30
≥4 (n=32)	15.38 ^c	6.47	12.75 ^c	7.70	11.31 ^c	6.62	3.72 ^{bc}	3.71
Spearman's correlation	0.503***		0.354***		0.381***		0.369***	

Different letters intra-domain indicate statistically significant differences among scores *** $p < 0.001$. PIDAQ: Psychosocial impact of dental esthetics questionnaire, IOTN-AC: Index of orthodontic treatment need-esthetic concern, SI: Social impact, PI: Psychological impact, DSC: Dental self-confidence.

Table 4 compares the PIDAQ domains based on POS scores and Pearson's correlation coefficient

for the correlation between PIDAQ domains and POS scores. According to the POS scores, the participants were divided into four groups. The mean scores of PIDAQ domains were significantly different regarding POS scores. Furthermore, a significant correlation existed between the POS score and the scores of the questionnaire domains (Table 5).

Table 3: Comparison of PIDAQ domains based on IOTN-DHC scores and the Spearman's correlation coefficient for the correlation between PIDAQ domains and IOTN-DHC scores

IOTN-DHC Score	R.DSC***		SI***		PI***		AC***	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1 (n=137)	8.10 ^a	5.32	6.34 ^a	5.30	5.65 ^a	5.15	1.80 ^a	2.63
2 (n=175)	11.90 ^b	4.54	8.93 ^{ab}	5.68	8.07 ^b	5.16	3.03 ^{ab}	2.74
3 (n=61)	14.89 ^c	6.18	13.36 ^{bc}	7.40	11.56 ^b	6.10	4.90 ^{bc}	3.35
≥4 (n=27)	17.33 ^d	5.60	11.15 ^{bc}	9.03	11.11 ^b	6.20	4.19 ^c	3.86
Spearman's correlation	0.478***		0.314***		0.345***		0.310***	

Different letters intra-domain indicate statistically significant differences among scores ***p<0.001. PIDAQ: Psychosocial impact of dental esthetics questionnaire, IOTN-AC: Index of orthodontic treatment need-esthetic concern, SI: Social impact, PI: Psychological impact, DSC: Dental self-confidence.

Table 4: Assessment of internal consistency for the psychosocial impact of dental esthetics questionnaire domains (n=400)

Domain	Mean	SD	Min	Max	α	α if item deleted	Range of inter-item correlation	MI (%)
R.DSC (6 items)	11.42	5.87	0.00	24.00	0.945	0.928–0.942	0.770–0.883	0
SI (8 items)	8.87	6.54	0.00	32.00	0.900	0.880–0.899	0.556–0.771	0
PI (6 items)	7.98	5.77	0.00	24.00	0.915	0.891–0.924	0.615–0.832	0
AC (3 items)	2.97	3.07	0.00	12.00	0.935	0.888–0.928	0.838–0.888	0

α: Cronbach's alpha, MI: Percentage of missing items, SI: Social impact, PI: Psychological impact, DSC: Dental self-confidence, AC: Esthetic concern.

Table 5: Comparison of the PIDAQ domains based on POS scores and Pearson's correlation coefficient for the correlation between PIDAQ domains and POS scores

POS Score	R.DSC***		SI***		PI***		AC***	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
0 (n=226)	9.18 ^a	5.07	6.90 ^a	5.23	5.97 ^a	4.96	2.12 ^a	2.58
1 (n=69)	12.48 ^b	5.21	9.97 ^b	6.95	10.20 ^b	5.62	3.51 ^b	3.35
2 (n=77)	14.16 ^b	5.19	11.71 ^{bc}	6.50	10.31 ^b	5.52	4.32 ^b	3.12
≥3 (n=28)	19.36 ^c	4.47	14.21 ^c	8.71	12.29 ^b	6.32	4.82 ^b	3.56
Spearman's correlation	0.509***		0.362***		0.375***		0.320***	

Different letters intra-domain indicate statistically significant differences among scores ***p<0.001. PIDAQ: Psychosocial impact of dental esthetics questionnaire, IOTN-AC: Index of orthodontic treatment need-esthetic concern, SI: Social impact, PI: Psychological impact, DSC: Dental self-confidence.

Reliability

Table 4 shows the results of the assessment of internal consistency of the PIDAQ domains. The Cronbach's alpha was >0.900, which is the minimum acceptable value for a questionnaire for clinical diagnosis [29]. By eliminating the questions, this value did not increase significantly. Furthermore, the correlation between the domain factors and the domains themselves was acceptable. The data had no missing value. Table 6 presents the results of test-retest reliability. The ICC value for all domains was over 0.926, which was excellent, according

to Cicchetti's classification [30]. No significant difference was noted between the first and second measurements. A small percentage was out of the confidence interval of limits of agreement, which indicated high agreement in domains at the two measurement time points. The changes in limits of agreement ranged from 92% to 97%. The range of changes in standard measurement error was 0.750–1.807. Furthermore, there was no missing value (Table 6).

Discussion

This study translated the PIDAQ to Farsi and assessed its cultural adaptation, validity, and reproducibility. After translation and back-translation by experts in the field, and determining its content validity and face validity, it was found that the primary Farsi version of PIDAQ had optimal cultural adaptation and did not require any modification. The exploratory and confirmatory factor analyses were used to assess the criterion validity of the translated version of the questionnaire. The results confirmed an adequate sample size. Furthermore, adequate correlation was noted between the questionnaire domains. The four-factor model was determined by exploratory factor analysis [20]. Studies on the Croatian, Brazilian, Italian, and Spanish versions of this questionnaire suggested the four-factor model [1], [22], [25], [26], while a study on its Chinese version suggested the three-factor model [17].

One method for validity assessment is to assess the criterion validity, which was used in this study. For this purpose, the mean scores of PIDAQ domains and their correlation with IOTN-AC, IOTN-DHC, and POS scores were evaluated. The mean scores of PIDAQ domains showed significant differences regarding IOTN-AC, IOTN-DHC, and POS scores. Furthermore, the IOTN-AC, IOTN-DHC, and POS scores had significant correlations with the PIDAQ domain scores.

To assess the reliability of the questionnaire, its internal consistency and test-retest reliability were calculated. The Cronbach's alpha was 0.945 for DSC, 0.900 for SI, 0.915 for PI, and 0.935 for AC. These values were 0.91, 0.86, 0.87, and 0.87, respectively, for the four domains of the original English version of the questionnaire [20]. The Italian, Chinese, Croatian,

Table 6: Results of test-retest reliability (n=75) for the psychosocial impact of dental esthetics questionnaire domains

Domain	ICC (95%CI)	SME	SDC	Paired difference mean	95% CI	P	MI (%)	LOA
DSC (6 items)	0.951 (0.924–0.969)	1.230	3.408	-0.320	-0.712–0.072	0.108	0	-3.656–3.0156 (97%)
SI (8 items)	0.926 (0.886–0.953)	1.807	5.009	-0.240	-0.832–0.352	0.422	0	-5.802–4.802 (96%)
PI (6 items)	0.961 (0.939–0.975)	1.146	3.178	0.267	0.116–0.649	0.169	0	-2.993–3.526 (92%)
AC (3 items)	0.937 (0.902–0.960)	0.750	2.080	0.013	-0.224–0.251	0.911	0	-2.012–2.038 (96%)

LOA: Limits of agreement: Calculated as paired mean difference ± 1.96 standard deviation (percentage within LOA), ICC: Intra-class correlation, SME: Standard measurement error, SDC: Smallest detectable change, p: Statistical significance of the paired t-test for each domain

Indian, Moroccan, Brazilian, and Spanish versions of the questionnaire reported Cronbach's alpha values ranging from 0.63 to 0.95. Our results showed that the Farsi version of this questionnaire had good reliability, according to Cronbach's alpha, in comparison with the original version of PIDAQ. The test-retest reliability was assessed by calculating the ICC. The ICC value for the aforementioned four domains was >0.926, which is excellent, according to Cicchetti's classification.

Conclusion

According to the results, the Farsi version of PIDAQ has good validity and reliability and can be reliably used for assessment of the dental esthetics-related quality of life of Iranian young adults.

Authors' Contributions

1. Concept and design of study or acquisition of data or analysis and interpretation of data: Amin Golshah, Haddis Esfandeyari, Nafiseh Nikkerdar, Mohammad Moslem Imani, Mohsen Safaei, Roohollah Sharifi, Hamid Reza Mozaffari, and Hedaiat Moradpoor
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3. Final approval of the version to be published: Amin Golshah, Haddis Esfandeyari, Nafiseh Nikkerdar, Mohammad Moslem Imani, Mohsen Safaei, Roohollah Sharifi, Hamid Reza Mozaffari, and Hedaiat Moradpoor
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