King Saud University

The Saudi Dental Journal

ORIGINAL ARTICLE

Adaptation and validation of the Moroccan Arabic version of the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ)

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Abstract *Objective:* The aims of this study were to translate and culturally adapt the PIDAQ native English version into Moroccan Arabic, and to assess the psychometric characteristics of the version thereby obtained.

Materials and methods: The PIDAQ original English version was sequentially subjected to translation into Moroccan Arabic, back-translation into English, committee review, and pre-testing in 30 subjects seeking orthodontic treatment.

Results: The final Moroccan Arabic version further underwent an analysis of psychometric properties on a random sample of 99 adult subjects (84 females and 15 males, aged 20.97 ± 1.10 years). The intraclass coefficient correlation of the scores of the responses obtained after administration of the questionnaire twice at a 1-month interval to a random sample of 30 subjects

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ranged from 0.63 for "Self-confidence" to 0.85 for "Social Impact". Cronbach α coefficients ranging from 0.78 for "Aesthetic Concerns" to 0.87 for "Self-confidence" were obtained; the different subscales of the Moroccan Arabic version of the PIDAQ showed good correlation with the perception of aesthetics and orthodontic treatment need.

Conclusion: The results of the present study indicate that the Moroccan Arabic version of the PIDAQ obtained following thorough adaptation of the native form is both reliable and valid. It is able to capture self-perception of orthodontic aesthetic and treatment need and is consistent with normative need for orthodontic treatment.

1. Introduction

Traditional methods of measuring oral health rely mainly on clinical dental parameters, and focus on the absence or presence of diseases. They are not informative on people's own perception of oral well-being, which involve functional, emotional and social factors.

Increasing awareness of the multidimensionality of oral health and of the inadequacy of the existing normative measures has prompted the development of *ad hoc* Quality of Life (Qol) instruments. Numerous Oral Health-Related Quality of Life (OHRQoL) assessment tools, either generic or specific, are now used to capture variables related to a subject's daily feelings, functioning, and coping strategies in response to their oral condition (Locker et al., 2001; Montero et al., 2011). However, in orthodontics, the Psychosocial Impact of Dental Aesthetics Questionnaire (PIDAQ) is the only measure developed and validated to date for use in young adults (Klages et al., 2006). This instrument assesses four factors: "Dental Self-confidence", "Social Impact", "Psychological Impact", and "Aesthetic Concerns" (Klages et al., 2006).

Like many other OHRQoL tools, the PIDAQ was developed and validated in English. Thus its use in Morocco, an Arabic-speaking country, first requires translation. However, a too-literal translation is perilous, as it can result in misinterpretation due to misleading connotative meanings (Allison et al., 1999; Beaton et al., 2000; Guillemin et al., 1993). Indeed, some phrases, when translated too literally, may lose all meaning in another culture (Beaton et al., 2000; Guillemin et al., 1993). It is therefore necessary, when localising QoL instruments, for the translation process to ensure semantic, experiential and inferential equivalence (Alghadeer et al., 2010). To that end, investigators must ensure that the meaning of each item is carried over into the target cultures, and that it conveys the same construct after translation. Some situations may have meaning in the source culture (original version), but not in the target culture (translated version); these need to be replaced by more appropriate situations that preserve the purpose and meaning covered by the items (Herdman et al., 1997, 1998). The same exercise needs to be applied to certain concepts, which because of cultural differences do not elicit the same representations (Herdman et al., 1997).

In addition, the psychometric characteristics of the translated version have to be assessed (Beaton et al., 2000).

The main aim of the present study was to translate and culturally adapt the PIDAQ to a Moroccan Arabic context. A further aim was to assess the psychometric characteristics of the translated version.

2. Subjects and methods

2.1. Original version

The PIDAQ (Psychosocial Impact of Dental Aesthetics Questionnaire) is a quality-of-life instrument developed and validated specifically for orthodontics following a series of preliminary investigations in the years 2004, 2005 and 2006 by Klages and coworkers. It includes items derived from the previously developed OQLQ (Orthognathic Quality of Life Questionnaire) (Cunningham et al., 2000, 2002).

The PIDAQ comprises 23 items divided into four domains, Self-confidence (six items), Social impact (eight items), Psychosocial impact (six items) and Aesthetic concerns (three items). Each item consists of an assertion written in the first person singular and in the present tense to be evaluated using a five-point Likert scale with numerical values 0 = "not at all", 1 = "a little", 2 = "somewhat", 3 = "strongly" and 4 = "very strongly".

Initially developed and tested for young adults, the PIDAQ is considered to work well on children and adolescents too.

2.2. Translation and cultural adaptation

The PIDAQ was translated and culturally adapted to Moroccan Arabic following the guidelines suggested by Guillemin et al. (1993). Four main steps were followed, namely translation, back-translation, committee review, and pre-testing.

The translation of the original English version of the PIDAQ was carried out independently by three persons proficient in English but whose first language was Moroccan Arabic. The resulting versions were then back-translated into English by three bilingual teachers working in Morocco, whose first language was English. A review committee made up of nine persons (three translators, three back-translators and three Moroccan orthodontic teachers) was convened to discuss the semantic equivalence of the different versions of the PIDAQ (the original, the three Arabic and the three back-translated versions). Disagreement among the different members of the review committee was resolved by discussion until a consensus was reached. It was decided to change some words into more colloquial Moroccan Arabic to make the questionnaire easier to understand and locally more meaningful. However, no new item generation was deemed necessary.

Some items puzzled some members of the review committee and needed reformulation. Examples of these are:

– Item 4 "I am proud of my teeth". The term "proud" as "feeling deep pleasure or satisfaction as a result of one's own achievements, or possessions" jars here in Moroccan Arabic and is rarely used: pride in this sense is socially dissonant and so not expressed. Hence two adjectives that were more appropriate in colloquial local Arabic were used to cover the overall meaning of "proud".
– Item 6 the term "distressed" could be misleading in Arabic. The expression "a little bit angry" was finally chosen to express a feeling of anxiety or pain or frustration.

2.3. Pre-testing

The final version obtained after the process of translation was further tested on 30 adult subjects requesting orthodontic treatment in four different private clinics.

After a few modifications, the final Moroccan Arabic version underwent an analysis of psychometric properties on random sample of adult subjects.

2.4. Study subjects

Students in 2nd, 3rd, 4th and 5th year from the Faculty of Dental Medicine, Casablanca (Morocco) were invited to take part in this psychometric analysis study. 99 students out of 360 were included; they met the following criteria: Native Moroccans totally fluent in Moroccan Arabic, having lived in Morocco for the previous 10 years, with no history of orthodontic treatment, in full possession of mental faculties.

Subjects with missing teeth not corrected by adequate prosthesis, those with severe periodontitis or pain in any part of the stomatognathic system were excluded from the study. The participants were briefed on the objective of the study and invited to sign an informed-consent form later. The present study was submitted first to the Ethics Committee of Casablanca School of Dentistry, and then the researchers were invited to present the research design orally to Ethics Committee of the School of Dentistry for evaluation and eventually approval if the project satisfies all the rules of ethics. In our case, approval was granted to the researchers to undertake the study.

2.5. Data collection

To address the aims of the study, a questionnaire was administered to the total number of 99 students. The response rate was 100% since all students returned the questionnaire. Four types of data were collected using the form shown in the appendix (the original Arabic version was translated for present purposes). These included:

● Demographic information: age at the time of the investigation and gender,
● Subjects' perception of orthodontic aesthetics, determined by asking the question "Are you satisfied with the alignment of your teeth?" The answer was recorded using

a five-point Likert type scale with 1 = "very dissatisfied", 2 = "dissatisfied", 3 = "fairly satisfied", 4 = "satisfied", 5 = "very satisfied".
● Subject's perception of need for orthodontic treatment, also referred to as "Subjective need", was determined by asking the question "Do you rank your teeth as needing orthodontic treatment? Possible responses was recorded using a Likert-type scale with 1 "No, absolutely not", 2 "No, I don't think so", 3 "No opinion" 4 "Yes, I think so" 5 "Yes, I am sure".
● Normative need for orthodontic treatment was assessed using the ICON (Index of Complexity Outcome and Need) (Klages et al., 2004). Typically, the ICON assesses treatment need on the grounds of five components: (i) aesthetic: aesthetic component of IOTN, (ii) upper arch crowding or spacing, (iii) crossbite, (iv) overbite or open bite, and (v) buccal segment anteroposterior relationships Daniels and Richmond (2000). The five components are then multiplied by their respective weighting and summed. An ICON summary score $\leqslant 43$ corresponds to "No need" for treatment, whereas an ICON score > 43 corresponds to "Definite need for treatment".

Subjects' quality of life attributable to their orthodontic aesthetics was assessed using the Arabic version of the PIDAQ translated and adapted as described above. Subjects were asked to evaluate the items using a five-point Likert scale with numerical values 0 = "Not at all", 1 = "A little", 2 = "Somewhat", 3 = "Strongly" and 4 = "Very strongly".

To check for reliability, a subset of 30 randomly chosen subjects was asked to complete the PIDAQ questionnaire once again 1 month later.

2.6. Data analysis

2.6.1. Descriptive statistics
Qualitative variables (gender, subject's perception of orthodontic aesthetics and perceived and normative need for orthodontic treatment) were described by their number (count) and percentages.

Quantitative variables (age and score of PIDAQ domains) whose distribution was shown to be normal (by a Kolmogorov/Smirnov test) were described using mean and standard deviation. Independent sample t test was used to analyse potential association between these dependent quantitative variables and the independent qualitative variables (gender, perceived and normative need for orthodontic treatment).

The remaining quantitative variables were ordinal, and were described by their number and percentages. Potential relationship between these last variables was tested for using Spearman rank order correlation.

2.6.2. Inferential statistics
Psychometric characteristics of the Moroccan Arabic version of the PIDAQ, i.e. its validity and reliability, were also tested.

2.7. Validity

Since there was neither a relevant criterion-related estimator of prediction nor a well-defined domain of content for determining validity, it was decided to use construct validity, where

good measures are convergent, and discriminant validity. Convergent validity was evaluated by examining the level of association between the PIDAQ scores and the perception of orthodontic aesthetics and treatment need. It was hypothesised that those subjects found to have high scores in each of the four domains of the PIDAQ would be more likely to report poor orthodontic aesthetics and subjective need for orthodontic treatment. Discriminant validity was estimated by assessing the association between subjects' PIDAQ domain scores and normative need for orthodontic treatment as given by the ICON.

2.8. Reliability

Reliability analysis included the computation of Cronbach's alpha coefficient and also the intra-class coefficient of the item scores obtained in 1 month in a subset of 30 subjects.

The α coefficient of Cronbach reflects the internal consistency of the items making up each domain using inter-score correlations. The intraclass correlation r reflects the closeness of the scores obtained by the same individual during the two assessments made 1 month apart.

All the statistical analyses were performed using SPSS (Statistical Package for Social Sciences, release 17 for Windows). The significance level was set at $p \leqslant 0.05$.

3. Results

3.1. Descriptive statistics

The study sample included 99 students; 84 females and 15 males, with ages ranging from 19 to 24 years (mean 20.97; SD 1.10) (Table 1). There was no significant difference between the age of males and females ($p = 0.15$).

Satisfaction of the subjects with respect to the orthodontic aesthetics of their own teeth is summarised in Table 2. About half of the subjects were either "satisfied" or "very satisfied" with their teeth and 22% had some degree of dissatisfaction. Women in this group were more satisfied with the appearance of their teeth than men ($p = 0.009$).

Concerning self-perception (subjective need) for orthodontic treatment, approximately 47% of the subjects believed or were sure they needed orthodontic treatment. Five subjects were sceptical (Table 3). Gender had no impact on the subjective need for orthodontic treatment ($p = 0.68$).

With respect to normative need for orthodontic treatment as assessed by the Index of Complexity Outcome and Need (ICON), 43.4% of the subjects displayed a definite need (Table 2). No statistically significant gender differences were found for normative treatment needs among the study subjects ($p = 0.74$).

Mean and standard deviation of the scores attained by the subjects for each of the PIDAQ domains are shown in Table 4. The domain "Self-confidence" had the highest score, with 2.50 ± 0.91 points. The domain "Aesthetic Concerns" displayed the lowest score, with 1.57 ± 0.81.

3.2. Inferential statistics

3.2.1. Reliability

The α Cronbach coefficient of the domains of the Moroccan Arabic version of the PIDAQ ranged from 0.78 for "Aesthetic Concerns" to 0.87 for "Self-confidence". The intraclass coefficient correlation of the scores of the responses obtained after administration of the questionnaire twice at a 1-month interval to a random sample of 30 subjects ranged from 0.63 for "Self-confidence" to 0.85 for "Social Impact" (Table 5).

Table 1 Demographic characteristics (Age, gender) of the study subjects.

Gender	Age (years)				t test
	Mean	S.D	Minimum	Maximum	p value
Men ($n = 15$)	21.53	1.68	19	24	0.15
Women ($n = 84$)	20.87	0.94	19	23	
Total ($n = 99$)	20.97	1.10	19	24	

Table 2 Self-Perceptions of orthodontic Aesthetics and normative need for orthodontic treatment.

	Aesthetics self-perception of orthodontic treatment in dental Students					χ2 test p value	Normative need for orthodontic treatment according to ICON n (%)		χ2 test p value
	Very dissatisfied	Dissatisfied	Somewhat satisfied	Satisfied	Very satisfied		No need	P value	
Men ($n = 15$)	2 (13.3)	6 (40)	1 (6.7)	3 (20)	3 (20)	0.14	7 (46.7)	8 (53.3)	0.74
Women ($n = 84$)	3 (3.6)	11 (13.1)	24 (28.6)	38 (45.2)	8 (9.5)		49 (58.3)	35 (41.7)	
Total ($n = 99$)	5 (5.1)	17 (17.2)	25 (25.3)	41 (41.4)	11 (11.1)		56 (56.6)	43 (43.4)	

Table 3 Self-perception of (subjective) need for orthodontic treatment among the study subjects.

	Self-perceived (subjective) need for orthodontic treatment n (%)					χ^2 test p value
	No absolutely	No I do not think so	No opinion	Yes I think so	Yes I am sure	
Men ($n = 15$)	3 (20)	4 (26.7)	0 (0)	4 (26.7)	4 (26.7)	0.68
Women ($n = 84$)	15 (17.9)	25 (29.8)	5 (6)	27 (32.1)	12 (14.3)	
Total ($n = 99$)	18 (18.2)	29 (29.3)	5 (5.1)	31 (31.3)	16 (16.2)	

Table 4 Scores obtained for the different domain of the Moroccan Arabic version by study subjects.

Domain (number of items)	Mean score ± S.D.
Self-confidence (6)	2.50 ± 0.91
Social impact (8)	1.60 ± 0.68
Psychological impact (6)	1.80 ± 0.75
Aesthetic concerns (3)	1.57 ± 0.81

Table 5 Reliability of the different subscales of the Moroccan Arabic version of the PIDAQ.

Subscales (number of items)	Reliability	
	Internal consistency Cronbach α coefficient	Reproducibility Intraclass correlation coefficient
Self-confidence (6)	0.87	0.63
Social impact (8)	0.84	0.85
Psychological impact (6)	0.81	0.78
Aesthetic concerns (3)	0.78	0.83

3.3. Validity

3.3.1. Convergent validity

The Spearman correlation matrix between the different subscales of the Moroccan Arabic version of the PIDAQ and the perception of aesthetics and orthodontic treatment need are displayed in Table 6. The scores for the domain "Dental self-confidence" were positively and significantly correlated with the scores of the subject's perceptions of the orthodontic aesthetics of their own teeth and negatively correlated with the subject's perception of need for orthodontic treatment.

The scores of the PIDAQ's domains "Social Impact", "Psychological Impact", "Aesthetic Concerns" displayed negative correlation with the scores of aesthetic perception, but their correlation with the scores for subjective need for treatment was negative.

Table 6 Spearman correlation matrix between the different subscales of the Moroccan Arabic version of the PIDAQ and the subject's perception of aesthetics and need for orthodontic treatment.

PIDAQ's domains	Aesthetics perception rho (p)	Orthodontic treatment need rho (p)
Self-confidence (6)	0.57[**] (0.00)	−0.49[**] (0.00)
Social impact (8)	−0.34[*] (0.00)	0.36[**] (0.00)
Psychological impact (6)	−0.60[*] (0.00)	0.59[**] (0.00)
Aesthetic concerns (3)	−0.55[**] (0.00)	0.46[**] (0.00)

[*] $p < 0.05$.
[**] $p < 0.01$.

3.3.2. Discriminant validity

Table 7 shows the distribution of the scores of the different domains of the Moroccan Arabic version of the PIDAQ according to the subject's profile with respect to orthodontic treatment need as assessed by ICON. The subjects with an obvious need for treatment had significantly higher scores for the different domains of the PIDAQ.

4. Discussion

Clinicians and researchers who do not have a suitable health-related quality of life (HRQOL) measure in their own language have two options: (i) develop a new tool, or (ii) modify a measure previously validated in another language, i.e. make a transcultural adaptation. The former is a time-consuming and costly procedure, because it would need conceptualisation, item generation, selection and reduction. The latter is simpler and can preserve the psychometric characteristics of the already developed tool. The Psychological Impact of Dental Aesthetic Questionnaire (PIDAQ) originally developed in English has since undergone three transcultural/adaptation processes in three different countries/languages: Spain/Spanish (Montiel-Company et al., 2013), Brazil/Portuguese (Sardenberg et al., 2011) and China/Chinese (Lin et al., 2011).

The present study aimed to adapt the PIDAQ into Moroccan Arabic. To this end, a set procedure was followed. Overall, the translation, back translation, pilot testing and review yielded a version that was locally understandable and acceptable. Neither factor analysis nor item generation was deemed necessary.

The psychometric characteristics of the newly adapted version were tested in 99 untreated adult subjects.

The Cronbach α coefficient, which is a good estimate of internal consistency, ranged from 0.78 to 0.87 for the different domains of the adapted Moroccan Arabic version of the PIDAQ. This can be considered as near-ideal internal consistency; Cronbach $\alpha > 0.7$ is accepted as good (Bland and Altman, 1997; Sijtsma, 2009a,b), but if it is equal or very close to 1, it may reflect redundancy of some items. Furthermore, the internal consistency of the different domains of the Moroccan Arabic version of the PIDAQ compared well

Table 7 Distribution of the scores of the different domains of the Moroccan Arabic version of the PIDAQ according to the subject's profile with respect to orthodontic treatment need as assessed by the Index of Complexity, Outcome and Need (ICON).

		Normative need for treatment according to ICON		t test p value
		Definite need ($n = 43$)	No need ($n = 56$)	
Self-confidence	Mean (S.D.)	2.11 (0.82)	2.80 (0.87)	< 0.0001
Psychological impact	Mean (S.D.)	1.80 (0.84)	1.44 (0.47)	0.009
Social impact	Mean (S.D.)	2.15 (0.84)	1.53 (0.49)	< 0.0001
Aesthetic concerns	Mean (S.D.)	1.97 (0.97)	1.27 (0.48)	< 0.0001

with those of the native version (α = 0.91, 0.86, 0.87, 0.87 respectively for Dental self-confidence, Social impact, Psychological impact and Aesthetic concern) (Klages et al., 2006) and its subsequent translated version. For instance, the Brazilian version displayed a Cronbach α of 0.75, 0.79, 0.83 and 0.91 respectively for Aesthetic concern, Psychological impact, Social impact and Dental self-confidence (Sardenberg et al., 2011), while the Spanish version showed a Cronbach α of 0.90 for dental self-confidence, 0.86 for social impact, 0.81 for psychological impact and 0.77 for aesthetic concern (Montiel-Company et al., 2013). We note that the Chinese version needed reduction of the domains of the original version from four to three (Lin et al., 2011).

Repeatability of the responses obtained from 30 subjects after a 1-month interval was satisfactory, with an intraclass coefficient correlation ranging from 0.63 for "Self-confidence" to 0.85 for "Social Impact" (Gisev et al., 2012; Weir, 2005).

These results demonstrate the reliability of the Moroccan Arabic version of the PIDAQ.

The instrument was assessed for both convergent and discriminant validity. In this regard, the results of the present study showed that subjects perceiving their teeth to be well aligned also had higher scores for "Dental self-confidence" ($r = 0.57$; $p < 0.001$). On the other hand, those subjects who subjectively felt a need for orthodontic treatment displayed less "Dental self-confidence".

"Social Impact", "Psychological Impact" and "Aesthetic Concerns" scores displayed a negative correlation with the aesthetic perception scores, but their correlation with the scores for subjective need for treatment was positive. Overall, these results indicate that all four domains of the Moroccan Arabic version of the PIDAQ can capture both self-perception of aesthetic impairment and need for treatment attributable to the presence of malocclusions.

With respect to discriminant validity, it was interesting to note that definite need for orthodontic treatment was associated with lower scores of "Self-confidence" and higher scores of "Social Impact", "Psychological Impact" and "Aesthetic Concerns". Thus the Moroccan Arabic version of PIDAQ is consistent with the ICON, which is a validated tool designed to assess normative need for orthodontic treatment.

5. Conclusion

The results of the present study indicate that the Moroccan Arabic version of the PIDAQ obtained following thorough adaptation of the native form is both reliable and valid. It is able to capture self-perception of orthodontic aesthetic and treatment need and is consistent with normative need for orthodontic treatment. These excellent psychometric properties make it useful to assess OHRQoL impairment attributable to malocclusion in Moroccan subjects. However, it would be interesting to use the Moroccan Arabic version of the PIDAQ with lay patients. A study comparing student dentists and lay Moroccan Arabic version of the PIDAQ patients

would be an interesting avenue of research. A very important implication of the present study is that Arab countries can use the Moroccan Arabic version of the PIDAQ provided that the PIDAQ questionnaire is culturally and linguistically adapted.

Conflict of interest

The authors have no conflict of interest to declare.

Appendix A.

هاذ الجمل اللي جايين كيوصفو كيفاش الناس كيقدرو يحسو بالشكل ديال سنانهم فالحياة اليومية. جاوب واش متفق ولا لا مع هاذ الجمل. جاوب بعفوية بلا ما تفكر بزاف.

متفق بزاف بزاف	متفق بزاف	متفق شوية	ما متفقش	
				1 ما كيعجبنيش نشوف سناني فالمراية
				2 كنعلي راسي لفوق منين كنضحك باش ما يبانوش سناني بزاف
				3 كنغير من الناس اللي عندهم سنانهم زوينين
				4 انا عاجبيني سناني (انا فخور بسناني)
				5 محيت ما نكونش كنعرف الناس مزيان كنبقا كنخمم شنو يقدرو يقولو فراسهمعلى سناني
				6 كنتقلق شوية محيت كنشوف السنان ديال الناس لخرين
				7 كيعجبني نوري سناني محيت كنضحك
				8 ما كيعجبنيش نشوف سناني فتصاور
				9 كنخاف ليديرو لي الناس شي ملاحظة على سناني
				10 شي مرات كنكون ما عاجبنيش الحال (حزين) بسباب الشكل ديال سناني
				11 كنظن بان اغلب الناس عندهم سنان احسن من ديا ولي
				12 كنكون فرحان مللي كنشوف سناني فالمراية
				13 شي مرات كنظن باللي الناس مركزين على سناني (كيحززو فسناني)
				14 علاقاتي الاجتماعية (التعامل ديالي مع الناس) كتكون شي مراة محدودة بسباب سناني
				15 شي مرات كنلقى راسي هاز يدي قبالة فمي باش نغطي ساني
				16 ما كنكونش مزيان محيت كنفكر فكي دايرين سناني (فالشكل دسناني)
				17 سناني كيعجبو الناس
				18 ما كيعجبنيش نشوف سناني محيت كنتفرج فشي فيديو فيه انا
				19 الملاحظات على سناني كيجرحوني واخا كيكونو غير بالضحك
				20 كنتمنى لو كان كانو سناني احسن
				21 انا عاجبني الشكل ديال سناني
				22 كنخمم شي مرات شنو غيقولو الاولاد (البنات) (الجنس الاخر) على سناني
				23 كيعجبني الترتيب دسناني

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