Translation and validation of the Chinese version of the psychosocial impact of dental aesthetics questionnaire

Haiyan Lin*, Chuntian Quan**, Congcong Guo*, Chen Zhou*, Yuanyuan Wang* and Baicheng Bao***

*Guanghua School of Stomatology, SunYat-sen University, **Guangdong Provincial Stomatological Hospital and Orthodontics, Guanghua School of Stomatology, Hospital of Stomatology, SunYat-sen University, Guangzhou, China

Correspondence to: Baicheng Bao, Department of Orthodontics, Hospital of Stomatology, SunYat-sen University, Lingyuan Xilu No. 56, Guangzhou 510055, China. E-mail: baobaicheng@gmail.com

SUMMARY The psychosocial impact of dental aesthetics questionnaire (PIDAQ) could reflect dental aesthetic degrees evaluated by traditional dental aesthetic indices. However, no Chinese version of PIDAQ has been used. The aim of this study was to translate the original English version of PIDAQ into Chinese and to assess the validity and reliability of the Chinese version for application in Chinese young adults. The questionnaire was translated into Chinese, back translated, pre-tested, and cross-culturally adapted. Subsequently, the Chinese version of PIDAQ along with two other scales, the aesthetic component of Index of Orthodontic Treatment Need and the Perception of Occlusion Scale, were administered to 436 young adults from the city of Guangzhou, China. Two hundred and twenty-five of them perceived ‘have demand’ for orthodontics and 221 perceived ‘no demand’. Cronbach’s alpha of the translated PIDAQ was 0.94, corrected item–total correlation ranged from 0.39 to 0.81. The 23 items of PIDAQ were divided into three domains. There was a logical relation between the items in the same domain and a highly significant association between scores of PIDAQ and the two other scales. The ‘have demand’ group scored significantly higher than the ‘no demand’ group using PIDAQ (P < 0.01). The translated Chinese version of PIDAQ demonstrated good reliability, validity, and responsiveness. Its sufficient discriminative and evaluative psychometric properties provide the theoretical evidence for further use in study on orthodontic-specific aspects of quality of life among Chinese young adults.

Introduction

Quality of life (QOL) is a comprehensive index that assesses patients’ overall health of physical status, psychological status, and social adaptation (Johansson et al., 2010; Lee et al., 2010). Previous studies confirmed that minor differences in dental aesthetics may have a significant effect on perceived QOL. In subjects with high self-consciousness, this effect was more significant (Klages et al., 2004).

Demand for orthodontic treatment is mainly decided by individual attention to his or her own dental–facial appearance and other social and psychological factors (Bernabe and Flores-Mir, 2006; Bernabe et al., 2006). However, traditional assessment of orthodontic treatment need is principally based on evaluation of normal occlusion and cephalometric measurement (Gherunpong et al., 2006). These methods merely reflect the views of professionals rather than patients’ expectations. This is a serious flaw since professionals and patients are very different in perception of dental–facial appearance and orthodontic treatment need (Klages et al., 2004).

Recently, a growing number of researchers studying oral health-related quality of life (OHRQOL) have become more interested in psychological scale (Birkeland et al., 2000; Kok et al., 2004) and have focused on the patients’ perception of body image during orthodontic treatment planning (Bos et al., 2003). It has been proven by some scholars that combination of OHRQOL measurement tools and occlusal indices in predicting orthodontic concern is effective (Cunningham et al., 2001; O’Brien et al., 2006; Tajima et al., 2007; Phillips and Beal, 2009). Young adults tend to be strongly concerned about their body image, which plays an important role in psychological and social adaptation and education success (Onyeso and Sanu, 2005).

Questionnaire is the most commonly used measurement tool of QOL. Klages et al. (2006) designed a new questionnaire, which is a specialized measure for evaluation of orthodontic-related QOL, named psychosocial impact of dental aesthetics questionnaire (PIDAQ). PIDAQ can distinguish self-evaluated dental aesthetic degrees by the aesthetic component of Index of Orthodontic Treatment Need (IOTN-AC) and Perception of Occlusion Scale (POS; Espeland and Stenvik, 1991a, b). Prior to applying a questionnaire in another population with a different culture, rigorous translation and validation processes are essential (Wong et al., 2002; Ng et al., 2005). The approaches of translation and validation have been proposed by the International Quality of Life Assessment (IQOLA) Project (Aaronson et al., 1992).
The Brazilian version of PIDAQ was published in 2011 (Sardenberg et al., 2011). Heretofore, no Chinese version of PIDAQ has been published in any international journals. In this study, English version of PIDAQ was translated into Chinese and validated, in order to provide the theoretical basis for further application in Chinese population.

Subjects and methods

Formation of the Chinese version of PIDAQ

Translation. PIDAQ was translated into Chinese by four orthodontics postgraduate students who were all proficient in English and Chinese independently. After serious discussion, the first draft of translation was formed.

Back translation. The first draft of translation was translated back into English by a dental postgraduate student, an English major student, and an English teacher, respectively. After back translation, comparison, and modification, the Chinese version I was formed. The three members were all uninformed of the original scale.

Assessment of the translation quality. Two orthodontic specialists and a professional medical English teacher gave their comments on the accuracy, clarity, and popularity of the translation and proposed their amendments. All their efforts led to the formation of Chinese version II.

Cultural adaptation. Cultural adaptation of the Chinese version II was accomplished by two core working groups. One was formed by orthodontists from the Department of Orthodontics, Affiliated Hospital of Stomatology, SunYat-sen University, China. The other was composed of community groups in Guangzhou urban district. Conceptual equivalence and semantic equivalence were investigated to make a further revision, therefore came out the Chinese version III.

Pre-test. Thirty Guangzhou young adults without orthodontic treatment experience, aged from 18 to 30 years, half female, and the other half male, participated in the pre-test of Chinese version III. According to the 30 completed questionnaires, appropriate amendments were made to the Chinese version III, and eventually, the final Chinese version of PIDAQ was formed (Appendix 1).

The Chinese version of questionnaires in use

Psychosocial impact of dental aesthetics questionnaire. A five-point Likert scale ranging from 0 to 4 is used when the individuals are asked to rate the positive or negative impact of dental aesthetics. In the scale, 0, 1, 2, 3, and 4 indicate not at all, a little, somewhat, strongly, and very strongly, respectively. Some domains have scores reversed to produce a consistent measure of the impacts, in order to ensure the same direction of scoring for all items of the questionnaire (Klages et al., 2006; de Paula Junior et al., 2009).

The aesthetic component of Index of Orthodontic Treatment Need. It is used to assess dental aesthetics. Ten black and white photographs of anterior teeth displaying varying degrees of malocclusion are presented in front of the subjects, and each subject is asked to indicate which photograph resembles his or her own dentition most closely, without time limit for studying the photographs (Brook and Shaw, 1989).

Perception of Occlusion Scale. The subjects are presented with six items referring to dental arrangements with aesthetic significance. The six items are ‘There are gaps between the upper front teeth’; ‘The upper front teeth are crowded’; ‘The lower front teeth are crowded’; ‘The upper front teeth are irregular’; ‘The lower front teeth are irregular’; and ‘The upper front teeth are positioned too far anterior to the lower front teeth (the overjet is too large)’. The scoring of POS is an agreement on a five-point scale as PIDAQ.

Population in the survey

Young adults were randomly selected from Guangzhou area, China. Questionnaire survey was conducted by using Chinese version of PIDAQ, IOTN-AC, and POS. All individuals were asked whether they had demand for orthodontic treatment. One hundred individuals of them were randomly selected for retest 10 days after the first test.

Statistical analysis

Internal consistency Cronbach’s alpha coefficient and coefficient of correlation between items and scale were analysed to demonstrate the reliability of the scale and the retest reliability as well.

Construct validity was studied by factor analysis of scale, and total score of PIDAQ and scores of its dimensions were compared with self-evaluation of the IOTN-AC and POS by one-way analysis of variance (ANOVA). Correlation of PIDAQ and the other two scales was analysed to test its criterion validity.

Difference of scores between the two groups (‘have demand’ and ‘no demand’) was analysed to determine the responsiveness of PIDAQ.

Results

A total of 436 individuals were surveyed, aged from 18 to 36 years old, mean age was (22.3 ± 2.9) years old, and proportion of male was 41.1%. There were 436 valid questionnaires involving no one with missing data, and 92% of 100 retest questionnaires were completed. Two hundred and twenty-five individuals of them perceived have demand...
Table 1: Factor loadings of the items of the psychosocial impact of dental aesthetics questionnaire (PIDAQ) scales after principal component analysis and orthogonal rotation, amount and percentage of variance explained by each factor (initial and rotated solution), and ‘alpha when item deleted’ from the respective scale.

<table>
<thead>
<tr>
<th>Items in brief</th>
<th>Social impact</th>
<th>Aesthetics attitude</th>
<th>Dental confidence</th>
<th>Alpha if item deleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Hold back when I smile</td>
<td>0.66*</td>
<td>0.19</td>
<td>0.11</td>
<td>0.94</td>
</tr>
<tr>
<td>2 What others think</td>
<td>0.78*</td>
<td>0.09</td>
<td>−0.05</td>
<td>0.94</td>
</tr>
<tr>
<td>3 Offensive remarks</td>
<td>0.77*</td>
<td>0.16</td>
<td>0.05</td>
<td>0.94</td>
</tr>
<tr>
<td>4 Inhibited in social contacts</td>
<td>0.76*</td>
<td>0.37</td>
<td>0.20</td>
<td>0.94</td>
</tr>
<tr>
<td>5 Hide my teeth</td>
<td>0.68*</td>
<td>0.26</td>
<td>0.13</td>
<td>0.94</td>
</tr>
<tr>
<td>6 People stare</td>
<td>0.75*</td>
<td>0.25</td>
<td>−0.04</td>
<td>0.94</td>
</tr>
<tr>
<td>7 Irritated on remarks</td>
<td>0.72*</td>
<td>0.32</td>
<td>0.03</td>
<td>0.94</td>
</tr>
<tr>
<td>8 Worry about opposite sex</td>
<td>0.70*</td>
<td>0.37</td>
<td>0.09</td>
<td>0.94</td>
</tr>
<tr>
<td>9 Envy</td>
<td>0.26</td>
<td>0.70*</td>
<td>0.23</td>
<td>0.94</td>
</tr>
<tr>
<td>10 Somewhat distressed</td>
<td>0.52</td>
<td>0.60*</td>
<td>0.09</td>
<td>0.94</td>
</tr>
<tr>
<td>11 Somewhat unhappy</td>
<td>0.49</td>
<td>0.68*</td>
<td>0.24</td>
<td>0.94</td>
</tr>
<tr>
<td>12 Others have nicer teeth</td>
<td>0.34</td>
<td>0.64*</td>
<td>0.25</td>
<td>0.94</td>
</tr>
<tr>
<td>13 Feel bad</td>
<td>0.50</td>
<td>0.66*</td>
<td>0.23</td>
<td>0.94</td>
</tr>
<tr>
<td>14 Wish teeth looked better</td>
<td>0.11</td>
<td>0.73*</td>
<td>0.21</td>
<td>0.94</td>
</tr>
<tr>
<td>15 Do not like teeth in mirror</td>
<td>0.56</td>
<td>0.63*</td>
<td>0.19</td>
<td>0.94</td>
</tr>
<tr>
<td>16 Do not like teeth in photo</td>
<td>0.56</td>
<td>0.61*</td>
<td>0.18</td>
<td>0.94</td>
</tr>
<tr>
<td>17 Do not like teeth on video</td>
<td>0.60</td>
<td>0.61*</td>
<td>0.15</td>
<td>0.94</td>
</tr>
<tr>
<td>18 Proud of teeth</td>
<td>0.06</td>
<td>0.20</td>
<td>0.87*</td>
<td>0.94</td>
</tr>
<tr>
<td>19 Like to show teeth</td>
<td>0.16</td>
<td>−0.03</td>
<td>0.78*</td>
<td>0.94</td>
</tr>
<tr>
<td>20 Pleased to see teeth in mirror</td>
<td>0.07</td>
<td>0.16</td>
<td>0.86*</td>
<td>0.94</td>
</tr>
<tr>
<td>21 Teeth are attractive</td>
<td>−0.06</td>
<td>0.18</td>
<td>0.79*</td>
<td>0.94</td>
</tr>
<tr>
<td>22 Satisfied with appearance</td>
<td>0.16</td>
<td>0.30</td>
<td>0.81*</td>
<td>0.94</td>
</tr>
<tr>
<td>23 Find tooth position nice</td>
<td>0.03</td>
<td>0.23</td>
<td>0.82*</td>
<td>0.94</td>
</tr>
</tbody>
</table>

Amount of variance explained (initial solution) 10.59
Percentage of variance explained (initial solution) 46.03
Percentage of variance explained (rotated solution) 27.14

*Salient factor loading.

and 211 perceived no demand when asked whether they had orthodontic treatment demand.

Reliability

Scale internal consistency Cronbach’s alpha coefficient was 0.942; standard Cronbach’s alpha coefficient was 0.943. Correlation coefficients of items and scale were between 0.39 and 0.81. Principal component factor analysis extracted three dimensions, and their Cronbach’s alpha coefficients were 0.905, 0.933, and 0.917 (Table 1). The scale total test–retest correlation coefficient was 0.978, and the three dimensions correlation coefficients were 0.964, 0.989, and 0.986.

Construct validity

In factor analysis, three common factors were extracted. Common factor 1 contained the items (items 1–8) of the original sub-domain of social impact of dental aesthetics. Common factor 2 included items (items 9–17) reflecting the impact of teeth appearance to the individual aesthetic attitude. Common factor 3 embodied items (items 18–23) reflecting individual self-confidence of dental appearance, which were also the items of dental confidence in the original sub-domain (Table 1).

Criterion validity

Correlation between PIDAQ and IOTN-AC and POS were statistically significant (Table 2 and Table 3).

Responsiveness

There was statistical significance in total PIDAQ score and scores of its three dimensions between the two groups (Table 4).

Ethics

The study was approved by Ethics Committee of Affiliated Stomatological Hospital, Guanghua College of Stomatology, SunYat-sen University, Guangzhou. All participants were volunteers and their voluntary informed consent was obtained prior to conducting this experiment.

Discussion

Translation, back translation, and cultural adaptation of the PIDAQ

QOL is culturally dependant, which must be established under a certain cultural value system. Before application of a health-related QOL questionnaire abroad, it should pass...
through the cross-cultural adaptation process, including questionnaire translation and evaluation of its psychometric properties. Only when the questionnaire showed good psychometric properties, could it be used in the local cultural context. This study followed the cross-cultural adaptation process proposed by the IQOLA Project (Aaronson et al., 1992) to develop the Chinese version of PIDAQ, in order to ensure that the development of the Chinese questionnaire is of theoretical value.

Cross-cultural application of a questionnaire must be fit in with the local culture and people. Translation of PIDAQ was a rather rigorous procedure, including four steps: translation, back translation, cultural adaptation, and pre-tested. In order to translate accurately and meet the original intention, PIDAQ was translated into simple Chinese by four translators who were fluent in both Chinese and English to express accurately as far as possible. The translation quality was evaluated in three areas: translation accuracy, clarity, and popularity. To detect potential problems in translation, the back translation version and the original version were compared. In the results, the majority of entries in the back translation were in line with the original items. Only the expression of several items was not the same as the original, but they had similar meaning.

Cultural adaptation is the process of evaluating the equivalence of the original questionnaire and the new one. To evaluate equivalence of a questionnaire for different language versions, at least four types of equivalence need to be considered: conceptual, semantic, technical, and psychometric equivalence. In this study, the core working group composed of orthodontists participated in the discussion on the translation of each entry, mainly on the conceptual and semantic equivalence of Chinese version and the original. Opinions and suggestions were obtained from a number of young adults to revise those entries difficult in understanding and ambiguous in meaning, to make the Chinese version acceptable for the young adults of different levels and education.

The psychometrics properties of the Chinese version of PIDAQ

The Cronbach’s alpha coefficient of Chinese version of PIDAQ was higher than the general requirements of a questionnaire reliability coefficient (0.70), also higher than the original version and the Brazilian version of PIDAQ (Klages et al., 2006; Sardenberg et al., 2011). Item–total correlation also reached to the general requirements (0.20). ‘Alpha if item deleted’ had shown that if an entry was

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Table 4  T-test of scores between two samples: ‘have demand’ group and ‘no demand’ group. TH, total ‘have demand’ group; TN, total ‘no demand’ group; FH, female ‘have demand’ group; FN, female ‘no demand’ group; MH, male ‘have demand’ group; MN, male ‘no demand’ group; \( \delta \Delta \bar{X} \), mean difference; PIDAQ, psychosocial impact of dental aesthetics questionnaire.

<table>
<thead>
<tr>
<th></th>
<th>TH versus TN</th>
<th>FH versus FN</th>
<th>MH versus MN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social impact</td>
<td>5.16</td>
<td>6.08</td>
<td>4.01</td>
</tr>
<tr>
<td>Aesthetics attitude</td>
<td>8.32</td>
<td>8.26</td>
<td>8.13</td>
</tr>
<tr>
<td>Dental confidence</td>
<td>5.04</td>
<td>5.29</td>
<td>5.37</td>
</tr>
<tr>
<td>Total PIDAQ</td>
<td>18.51</td>
<td>19.62</td>
<td>17.51</td>
</tr>
</tbody>
</table>

\( **p < 0.01. \)

removed from the PIDAQ, the total questionnaire Cronbach’s alpha coefficient would not significantly increase, indicating that its entries had good internal consistency. Retest reliability should reach more than 0.70, the total test–retest correlation of the PIDAQ and its three dimensions were higher than 0.90. Therefore, it could be considered that the PIDAQ had good reliability.

Factor analysis is generally used in valuation of construct validity. In this study, three common factors were extracted from 23 items. Two extracted common factors, ‘social impact’ and ‘dental confidence’, were consistent with the entries contained in the corresponding dimensions of the original PIDAQ. The third common factor included all the entries in the two dimensions of original English version, ‘psychological impact’ and ‘aesthetic concern’. The word ‘attitude’ could be explained as a state of mind or a feeling. In the original version of PIDAQ, the factor ‘psychological impact of dental aesthetics’ has the intention of assessing the potential psychological impact of malocclusion, and the fourth factor ‘aesthetic concern’ is referring to feelings of uneasiness when confronted with one’s own dental appearance (Klages et al., 2006). Both meanings could be represented by the word ‘attitude’. The attitude towards dental aesthetics could also reflect the demand for orthodontic treatment. So the third common factor was renamed ‘aesthetics attitude’.

When a four-factorial analysis was run, the result showed that there were only two items included in the fourth factor. The two items were ‘I envy the nice teeth of other people’ and ‘I wish my teeth looked better’. Those items remained in the third and fourth factor of the original version were combined to form a new factor. The result seemed not reasonable since the two items should not be divided from the original third factor. When ‘Eigenvalue over 1’ was set, the result of factor analysis showed that a new factor (aesthetics attitude) was the combination of items from the original third and fourth factors. Perhaps, in Chinese young adults, the feelings of uneasiness when confronted with one’s own dental appearance seemed closely associated with the potential psychological impact of malocclusion.

This was a little different from the original version and the Brazilian version of PIDAQ, which was divided into four domains (Klages et al., 2006; Sardenberg et al., 2011).

The cumulative contribution rate of the three common factors showed that information only lost about one-third, higher than the cumulative contribution amount of the four common factors extracted from the original English version (63.28 per cent; Klages et al., 2006). Because of different cultural background and expression, there are some differences between factor analysis results and division of dimensions from original PIDAQ. However, the three dimensions of Chinese version of PIDAQ could represent information in three areas, and items of each dimension had internal logic of their own. Therefore, the questionnaire had good construct validity, and content validity was also quite satisfactory.

Criterion validity is the correlation between the testing questionnaire and a recognized and effective standardized one. In this study, IOTN-AC and POS, commonly used in China, were used as standard to verify the Chinese version of PIDAQ. The results showed that Chinese version could discriminate IOTN-AC score of different grades and different ranges of POS, the same as the original English version.

The degree of responsiveness is to investigate the responsive or reactive sensitivity index: whether the questionnaire has the capacity of measuring small changes in QOL. The following two aspects are often used to investigate the responsiveness of a questionnaire: 1. Capability of distinguishing individuals (or groups) changes in QOL as time goes by and 2. Capability of distinguishing QOL in two different populations (‘have demand’ and ‘no demand’). In this study, all young adults were divided into two groups according to individual self-reported treatment demand. Scores of total PIDAQ and its domains were significantly different between groups, suggesting that the scales could distinguish the OHRQOL between the two groups. The results demonstrated good responsiveness of PIDAQ in both male and female Chinese young adults.
Conclusions

The translated Chinese version of PIDAQ demonstrated good reliability, validity, and responsiveness. Its sufficient discriminative and evaluative psychometric properties provide the theoretical evidence for further use in Chinese young adults. It is available for researchers in orthodontic-specific aspects of QOL study and may be a credible and effective evaluative instrument for study on QOL in orthodontics.

Funding

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Appendix 1
The Chinese version of PIDA.

牙科审美社会心理影响量表

社会影响
1. 当我微笑时我会有所掩饰，让自己的牙齿不暴露那么多
2. 对于我不熟悉的人，我有时会关注他们对我牙齿的看法
3. 我担心别人会对我的牙齿作出侮辱性的评论
4. 我有时会由于自己的牙齿而在社交场合有些拘束
5. 我有时会把手放在自己嘴巴前面来掩饰自己的牙齿
6. 有时我认为有人在盯着我的牙齿
7. 关于我牙齿的议论会刺激我，即使那只是开玩笑
8. 有时我担心异性对我牙齿的看法

美观态度
9. 我羡慕别人的好牙齿
10. 当我看到别人的牙齿，我感到有些伤心
11. 有时我对自己的牙齿外观感到有点不开心
12. 我想我认识的大多数人有比我更好的牙齿
13. 当我想到自己牙齿的样子的时候，我感觉不舒服
14. 我希望自己的牙齿看起来更好
15. 我不喜欢看到镜子里自己的牙齿
16. 我不喜欢看到照片里自己的牙齿
17. 当(假如)我看自己的视频，我不喜欢看到自己的牙齿

牙齿自信
18. 我对自己的牙齿很自豪
19. 当我微笑时，我喜欢显露自己的牙齿
20. 当我看到镜子里自己的牙齿，我很高兴
21. 我的牙齿对别人有吸引力
22. 我对自己的牙齿外观满意
23. 我觉得自己的牙齿位置非常好