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Translation and evaluation of a Chinese version of the Child Oral Health-related Quality of Life measure

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Objective. This study aims to translate and evaluate the performance of a Chinese version of the Child Oral Health-related Quality of Life (COHQoL©) measure composed of the Child Perception Questionnaire (CPQ), Parental Perception Questionnaire (PPQ), and Family Impact Scale (FIS).

Basic research design. Chinese versions of the measures were derived through a forward–backward translation. A consecutive sample of 168 children attending paediatric dental and orthodontic clinics in Hong Kong were recruited along with their attending primary caregiver. Children self-completed the 37-item CPQ and their attending primary caregiver self-completed the 31-item PPQ and 14-item FIS consecutively and independently. Reassessments were conducted prior to their next appointment.

Results. CPQ, PPQ, and FIS scores were associated with children's global rating of oral health ($P < 0.05$) and oral well-being ($P < 0.05$) supporting their construct validity. In addition, variations in CPQ, PPQ, and FIS were apparent with respect to patient group ($P < 0.05$) supporting their ability to distinguish between patient groups. Cronbach alpha values (internal reliability) and intraclass correlation coefficient values (test–retest reliability) for the three measures were > 0.80.

Conclusion. A Chinese version of the three components of the COHQoL measure was developed with minor modifications. In psychometric testing, the validity of the three components was supported and they demonstrated acceptable reliability.

Introduction

The importance of international collaborative dental research in paediatric dentistry is without question[1]. This has brought with it a need for international instruments for outcome assessment. Clinical *objective* oral epidemiological tools – measures of caries experience, periodontal status, and orthodontic treatment need – have adapted well to the demands of international research[2–4]. With agreement of diagnostic criteria and appropriate training, the sensitivity, specificity, and reliability of these measures have proved to be of acceptable standards.

Professionals' assessment of oral health status, however, represents only one dimension of the complex nature of oral health status[5]. There is increasing agreement of the need to incorporate some measure of the psychosocial impact of oral health when assessing oral health needs and when measuring oral health outcomes[6]. This, in turn, has led to the development of instruments (questionnaire) to assess oral health status from patients or the public's perceptions, commonly referred to as oral health-related quality of life measures[7]. The adaptation of such instruments for international research, however, poses a number of difficulties. First, there is the issue of language and cultural differences and thus the need to develop culturally equivalent measures[8]. Second, it is imperative that the psychometric properties of the instrument be assessed when employed in different settings as they should exhibit consistent findings by different researchers in different settings[9].

Within dentistry there has been an explosion of interest in assessing the impact of oral health on life quality, and a plethora of oral health-related quality of life measures exist[10]. These measures, however, have been developed

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for and primarily used among adult populations. Assessing the impact of oral health on the life quality of children is complex, and despite development in this research area for over three decades, only relatively recently have measures of child oral health-related quality of life emerged[11]. Of these, the Child Oral Health-related Quality of Life (COHQoL©) measure is a comprehensive measure that incorporates an assessment of children's own perceptions of the impact of oral health on life quality, primary caregivers/parents' assessment of the impact of the child's oral health on the life quality of the child, and primary caregivers/parents' assessment of the impact of oral health on family life[12–14].

This study aims to develop a Chinese version of the COHQoL measure: Chinese versions of the Child Perception Questionnaire (CPQ), Parental Perception Questionnaire (PPQ), and Family Impact Scale (FIS). In addition, this study aims to assess the psychometric properties (validity and reliability) of the three questionnaires that make up the COHQoL measure.

Methods

Translation process and validation of quality of the translation

The translation procedure followed was a forward and backwards translation process, where by a group of four bilingual Chinese and English speakers translated the measure from English to Chinese, and then it was translated back from Chinese to English by an independent group (three). Translators rated the difficulty of translating each item and made comments as appropriate. The quality of the translation was rated for (i) clarity of translation (use of simple and understandable expressions), (ii) common language use (avoidance of technical terms), and (iii) conceptual equivalence (representation of the content of the original source). Following reconciliation of problematic items among the three questionnaires (which arose as a result of different Chinese characters being suggested for the similar English language words), the measures were tested among focus groups composed of 25 children (to assess CPQ) and 25 primary caregivers of children (to assess PPQ and FIS) attending paediatric dental and orthodontic clinics who rated items for (i) clarity and (ii) relevance to assess face validity.

Psychometric testing

In assessing the validity and reliability, recruitment of children and their primary caregiver took place at assessment paediatric dental and orthodontic clinics over a 3-month period. Inclusion criteria were that children were of the age group 11–14 years, had no underlying serious medical conditions, and following screening were deemed to have a treatment need in the perspective disciplines (mutually exclusive). Children who met with inclusion criteria were invited to self-complete the CPQ and their attending parent was asked to self-complete the PPQ and FIS. Children and parents completed the questionnaires concurrently and independently (in separate rooms). Within 2 weeks and prior to their next appointment before any dental treatment was carried out on the children, half the sample was sent the CPQ for the children to self-complete; the others were sent the PPQ and FIS for parent who had attended the assessment clinic to self-complete and return by post.

The *construct validity* of the three components of Chinese version of the COHQoL measure was assessed by testing the following hypotheses: that children's self-rating of oral health (on a 5-point Likert scale with responses ranging from 'very poor' to 'excellent') and children's self-rating of the impact of their oral health on their overall well-being (on a 5-point Likert scale with responses ranging from 'not at all' to 'very much') would be associated with the child's oral health-related quality of life (CPQ scores, PPQ scores, FIS scores). In addition, to test whether the three measures could identify difference in oral health-related quality of life between the paediatric and orthodontic groups; based on the assumption that orthodontic patients would have poorer oral health-related quality of life[15,16].

Reliability was assessed in two ways. *Internal reliability* of the measure was assessed by testing the following hypothesis that the mean correlation between items within each measure

(and subdomain) would be moderate-to-high; mean correlation items was derived from Cronbach alpha values for each of the measures. *Test–retest reliability* was assessed by determining the level of association between initial and repeat assessments of CPQ, PPQ, and FIS, respectively, and based on the hypothesis that there would be strong correlation. This was derived by means of Intraclass Correlation Coefficients (ICC) calculated using the one-way random effect parallel model of initial and repeat assessments.

Since no specific guidelines with respect to appropriate sample power for testing the performance of the measure exist, an arbitrary sample size of 150 was proposed with the intention of recruiting approximately similar number of paediatric and orthodontic patients. In addition, it was proposed that half the children would be sent the CPQ to self-complete again and the attending parent of the other children would be sent the PPQ and FIS to self-complete again within 2 weeks.

This study was approved by the Ethics Committee of the Faculty of Dentistry, University of Hong Kong. Parents provided their written consent and children provided their verbal assent to participate.

Results

Translation process and validation of quality of the translation

Some difficulties were encountered regarding the clarity of the Chinese translation's, this in part arose because of colloquial differences in the Chinese language used by the different translators. Some concerns of the translation related to the conceptual equivalence of certain items; for example, the item 'difficulty biting or chewing foods such as fresh apples, corn on the cob, or firm meat' was considered inappropriate to use because of difference in foodstuffs commonly used in Chinese cuisine. Instead, the phrase 'difficult to bite or chew foods like apples, pork, or beef on the bone' was agreed upon to provide conceptual equivalence of the item rather than a direct verbal equivalence and was used in both the Chinese version of CPQ and PPQ. Among the focus groups, clarity of all items and overall questionnaire was considered good. In addition, the relevance of most items was considered high but some items were considered to have low relevance, for example, 'had difficulty playing a musical instrument'. It was agreed to keep the item ('had difficulty playing a musical instrument') because those who did play a musical instrument with their mouth may endorse the item and, therefore, it was potentially salient to the underlying concept.

Psychometric testing

A sample of 168 children and their primary caregivers were recruited over a 3-month period. Table 1 provides a summary of descriptive statistics: range, floor effect (% with score of 0), mean and standard deviation values as well as median and interquartile range values. Floor effects (% scoring zero) was evident particularly for the *emotional well-being* and *social well-being* subscales of CPQ (14% and 20%, respectively) and PPQ (29% and 38%, respectively). Approximately a quarter (23%) had an FIS score of zero and among its subdomains the floor effect was particularly evident ranging from 43% (*parental/family activity*) to 72% (*financial burden*). The range of scores CPQ, PPQ, and FIS varied considerably and maximum values observed among the study group was approximately half of the possible range of scores for the measures.

Children's global ratings of oral health was correlated with CPQ ($r = 0.39$, $P < 0.01$), PPQ ($r = 0.33$, $P < 0.01$), and FIS ($r = 0.31$, $P < 0.01$) overall scores (Table 2). In addition, children's global rating of overall well-being was correlated with CPQ ($r = 0.41$, $P < 0.01$), PPQ ($r = 0.37$, $P < 0.01$), and FIS ($r = 0.48$, $P < 0.01$). Correlation between children's rating of overall well-being was generally higher than children's rating of oral health with the three measures. Among some subscales, the observed correlation failed to reach a statistically significant level; for example, CPQ *oral symptom* scores was not significantly correlated with children's' global rating of oral health or global rating's of overall well-being.

Variations in CPQ ($P < 0.001$), PPQ ($P < 0.05$), and FIS ($P < 0.01$) scores were apparent between the paedodontic and orthodontic

Table 1. Descriptive distribution of CPQ, PPQ, FIS, and subscale scores.

	Possible range	Range	Floor effect (% score 0)	Mean (SD)	Median (IQR)
CPQ (overall scale)	0–148	7–67	0%	23.1 (12.8)	19.0 (13.0)
Subscales					
Oral symptoms	0–24	1–14	0%	7.4 (2.7)	7.0 (3.0)
Functional limitation	0–36	0–15	6%	4.6 (3.0)	4.0 (4.0)
Emotional well-being	0–36	0–28	14%	6.4 (6.1)	5.0 (7.0)
Social well-being	0–52	0–26	20%	4.7 (5.6)	2.0 (6.0)
PPQ (overall scale)	0–124	4–62	0%	19.1 (11.9)	15.0 (12.0)
Subscales					
Oral symptoms	0–24	1–17	0%	7.5 (2.8)	7.0 (4.0)
Functional limitation	0–32	0–17	15%	4.1 (3.4)	3.0 (5.0)
Emotional well-being	0–28	0–22	29%	4.1 (4.6)	3.0 (7.0)
Social well-being	0–40	0–26	38%	3.4 (4.7)	1.0 (5.0)
Family impact (overall scale)	0–56	0–28	23%	5.2 (5.5)	4.0 (7.0)
Subscales					
Parental/family activities	0–15	0–10	43%	1.9 (2.3)	1.0 (2.0)
Parental emotions	0–12	0–10	44%	1.8 (2.2)	1.0 (2.0)
Family conflict	0–12	0–8	60%	1.0 (1.6)	0.0 (2.0)
Financial burden	0–4	0–3	71%	0.5 (0.9)	0.0 (1.0)

CPQ, Child Perception Questionnaire; PPQ, Parental Perception Questionnaire; FIS, Family Impact Scale; IQR, interquartile range; SD, standard deviation.

Table 2. Construct validity: rank correlation between CPQ, PPQ, and FIS scales with global ratings of oral health and overall well-being.

	Oral health rating		Overall well-being rating	
Variables	***R****	***P*-value**		***P*-value**
CPQ	0.39	$P < 0.01$	0.41	$P < 0.01$
Subscales				
CPQ–oral symptoms	0.12	$P > 0.05$	0.13	$P > 0.05$
CPQ–functional limitations	0.19	$P < 0.05$	0.21	$P < 0.01$
CPQ–emotional well-being	0.35	$P < 0.01$	0.39	$P < 0.01$
CPQ–social well-being	0.32	$P < 0.01$	0.30	$P < 0.01$
PPQ	0.33	$P < 0.01$	0.37	$P < 0.01$
Subscales				
PPQ–oral symptoms	0.22	$P < 0.01$	0.15	$P > 0.05$
PPQ–functional limitations	0.23	$P < 0.01$	0.26	$P < 0.01$
PPQ–emotional well-being	0.30	$P < 0.01$	0.36	$P < 0.01$
PPQ–social well-being	0.34	$P < 0.01$	0.38	$P < 0.01$
FIS	0.31	$P < 0.01$	0.48	$P < 0.01$
Subscales				
Parental/family activity	0.27	$P < 0.01$	0.40	$P < 0.01$
Parental emotions	0.32	$P < 0.01$	0.43	$P < 0.01$
Family conflict	0.23	$P < 0.01$	0.37	$P < 0.01$
Financial burden	0.13	$P > 0.05$	0.25	$P < 0.01$

*r = Spearman's correlation. CPQ, Child Perception Questionnaire; PPQ, Parental Perception Questionnaire; FIS, Family Impact Scale.

patients (Table 3). Orthodontic patients had higher CPQ, PPQ, and FIS scores. Variations in CPQ and PPQ subscale scores between the paedodontic and orthodontic group were evident with the exception of the *oral symptoms* subscale of CPQ and the *functional limitations* subscale of PPQ ($P > 0.05$). With respect to FIS, only significant differences in *parental emotions* scores was evident between the paedodontic and orthodontic groups ($P < 0.05$).

The mean inter-item correlation (Cronbach alpha values) of all three questionnaires was above > 0.80: CPQ (0.89), PPQ (0.82), and FIS (0.82) (Table 4). Among the subscales of CPQ

Table 3. Discriminant validity: comparison of CPQ, PPQ, and FIS mean scores for paedodontic and orthodontic clinic patients.

Variables	Patient group		
	Paedodontic mean (SD)	Orthodontic mean (SD)	*P*-value*
CPQ	19.3 (11.3)	26.9 (13.2)	< 0.001
Subscales			
CPQ–oral symptoms	6.9 (2.6)	7.8 (2.7)	> 0.05
CPQ–functional limitations	4.1 (2.9)	5.1 (3.1)	< 0.05
CPQ–emotional well-being	5.0 (5.8)	7.8 (6.1)	< 0.001
CPQ–social well-being	3.3 (94.5)	6.1 (6.3)	< 0.01
PPQ	17.5 (11.9)	20.7 (11.6)	< 0.05
Subscales			
PPQ–oral symptoms	6.9 (2.8)	8.1 (2.7)	< 0.01
PPQ–functional limitations	3.9 (3.1)	4.2 (3.6)	> 0.05
PPQ–emotional well-being	3.7 (5.0)	4.5 (4.0)	< 0.05
PPQ–social well-being	2.9 (5.0)	3.9 (4.5)	< 0.01
FIS	4.6 (6.1)	5.8 (4.9)	< 0.01
Subscales			
Parental/family activity	1.7 (2.4)	2.1 (2.2)	> 0.05
Parental emotions	1.6 (2.4)	2.0 (1.9)	< 0.05
Family conflict	0.9 (1.6)	1.2 (1.6)	> 0.05
Financial burden	0.4 (0.8)	0.6 (0.9)	> 0.05

**P*-values derived from Mann–Whitney *U*-test. CPQ, Child Perception Questionnaire; PPQ, Parental Perception Questionnaire; FIS, Family Impact Scale.

Table 4. Reliability analysis: internal consistency (reliability) and test–retest reliability (*n* = 84).

	Reliability	
	Internal* (Cronbach alpha)	Test–retest** (ICC (95%CI))
Variable		
CPQ (36 items)	0.89	0.88 (0.81, 0.92)
CPQ–oral symptoms (6 items)	0.68	0.85 (0.65, 0.77)
CPQ–functional limitations (9 items)	0.78	0.73 (0.58, 0.82)
CPQ–emotional well-being (9 items)	0.86	0.82 (0.73, 0.88)
CPQ–social well-being (12 items)	0.88	0.64 (0.77, 0.90)
PPQ	0.82	0.83 (0.74, 0.89)
PPQ–oral symptoms	0.65	0.81 (0.70, 0.88)
PPQ–functional limitations	0.75	0.73 (0.58, 0.83)
PPQ–emotional well-being	0.85	0.71 (0.54, 0.81)
PPQ–social well-being	0.83	0.79 (0.68, 0.87)
FIS	0.82	0.87 (0.83, 0.92)
Parental/family activity (5 items)	0.73	0.76 (0.66, 0.84)
Parental emotions (4 items)	0.68	0.71 (0.58, 0.80)
Family conflict (4 items)	0.74	0.75 (0.60, 0.84)
Financial burden (1 item)	–	0.82 (0.72, 0.88)

*Internal reliability derived from Cronbach alpha values. **Test–retest reliability derived from intraclass correlation coefficient (one-way random effect model). CPQ, Child Perception Questionnaire; PPQ, Parental Perception Questionnaire; FIS, Family Impact Scale.

the mean inter-item correlations ranged from 0.68 (*oral symptoms*) to 0.88 (*social well-being*). The mean inter-item correlations for subscale of PPQ ranged from 0.65 (*oral symptoms*) to 0.85 (*emotional well-being*). Among the FIS the mean inter-item correlations ranged from 0.68 (*parental emotions*) to 0.74 (*family conflict*). Since the financial burden subscale consists of only one item, it was not possible to derive a mean inter-item correlation value.

In test–retest reliability, ICC values of > 0.80 were obtained of all three questionnaires: CPQ (0.88), PPQ (0.83), and FIS (0.87) (Table 4). Among the subscales of CPQ, ICC values ranged

from 0.64 (*social well-being*) to 0.85 (*oral symptoms*). ICC values among the subscales of PPQ ranged from 0.71 (*emotional well-being*) to 0.81 (*oral symptoms*). Among the subscales of FIS, ICC values ranged from 0.71 (*parental emotion*) to 0.82 (*financial burden*).

Discussion

The translation and validation of the quality of the translation process, although time consuming, raised issues that have relevance for all those involved in or planning to undertake cross-cultural research of child oral health-related quality of life. The issue of appropriateness of the wording of an item emerged and was modified so that it was conceptually equivalent to the original. It has been suggested that it is best to use English language versions of measures as templates to guide other language derivations and modify if possible to retain items[17]. The questionable relevance of the item relating to oral health's effect on 'playing a musical instrument' emerged in face validity testing. In providing an Arabic translation of CPQ in Saudi Arabia, it was decided to delete this item[18]. While discarding items that have low relevance may result in a more culturally appropriate measure, it does compromise cross-national comparison since overall scores would vary in comparison settings. Thus, from the onset it is important to decide upon whether the intention is to provide a measures that can facilitate cross-national or cross-cultural research or indeed both.

Significant correlations were observed between children's global ratings of oral health and children's global ratings of the effect of their oral on overall well-being with CPQ, PPQ, and FIS scores. The correlations could be interpreted as being of medium strength ($r \pm 0.30$–0.49)[19]. These findings adequately support the construct validity of the Chinese COHQoL measure. However, among some subscales, the observed correlations were not significant and often the strength of the correlations were weak ($r \pm 0.10$–0.29). This concurs with findings in their original validation and subsequent validation of CPQ in other settings[12,20]. Of note, a stronger correlation was generally observed between children's global ratings of the effect of their oral health on overall well-being with CPQ, PPQ, and FIS scores than children's global ratings of oral health and CPQ, PPQ, and FIS scores. This may relate to global ratings of overall well-being closer to construct of oral health-related quality of life than global rating of oral health.

Variation in CPQ, PPQ, and FIS scores were apparent between the dental paediatric and orthodontic group and with the expected higher scores (poor oral health-related quality of life) being observed among the orthodontic group. These findings support the ability of the Chinese COHQoL measure to distinguish between the two patient groups. Across some subdomains, variations in subscales failed to reach a level of statistical significance (i.e. *oral symptoms* of CPQ and PPQ). The weaker correlation observed with respect to oral symptoms is likely to be related to the diverse and dissimilar nature of the oral symptoms assessed by the domain. A weak correlation was also observed between global ratings and *financial burden* (FIS subscale), which may relate to the fact that this domain is assessed by a single item. This also suggests that overall scores should be used as the primary outcome measures as there is stronger support for their validity than for subscales alone.

Internal consistency (reliability) as assessed by Cronbach alpha values examines the extent to which a number of items addressing the same concept are actually doing so and this was tested for the overall scale and for each subscale. It has been suggested a Cronbach alpha values of 0.70 or greater can be interpreted as representing good internal consistency[21]. Thus, the three components of the Chinese COHQoL measure demonstrated acceptable levels of internal reliability. Cronbach alpha values obtained of the three Chinese mesaures were comparable with the values obtained in their original internal reliability testing[12–14]. Of note, among the oral symptom subscales of both CPQ and PPQ, Cronbach alpha values observed were marginally less than what could be interpreted as good (although still acceptable); perhaps the range of items assessing different oral symptoms might explain why their correlation was poorer compared

to other domains. Intraclass correlation coefficients of > 0.80 of initial CPQ, PPQ, and FIS, and repeat assessments were observed indicating good agreement, and among all subdomains test–retest reliability could be interpreted as substantial (> 0.60)[22]. Good–excellent test reliability of CPQ has been reported in a number of settings and with respect to PPQ and FIS in their original test–retest reliability[12–14,18,20]. Among subscales test–retest reliability varies but could generally be regarded as acceptable.

The three components of COHQoL measure psychometric properties were tested in a clinical setting. Thus, when employed in a nonclinical or population-based setting, the measures' psychometric properties should be confirmed. Moreover, it would be valuable to test the measures sensitivity with respect to specific oral childhood conditions and responsiveness to change following oral healthcare interventions. In addition, the development of short-form measures of CPQ and PPQ would be useful to derive.

In conclusion, Chinese versions of the CPQ, PPQ, and FIS were created with minor modifications to the questions. The three components of COHQoL demonstrated validity as well as acceptable reliability (internal and test–retest).

What this paper adds

- This paper describes the development of a Chinese version of the Child Oral Health-related Quality of Life (COHQoL) measure comprising the Child Perception Questionnaire (CPQ), Parental Perception Questionnaire (PPQ) and Family impact Scale (FIS) and evaluates their performance in terms of validity and reliability.

Why this paper is important to paediatric dentists

- The impact of oral health status on children's quality of life is important to consider in assessing oral health needs and outcomes from oral health care services/interventions.
- The paper provides details of the development of a Chinese version of the Child Oral Health-related Quality of Life measure which is of interest to those working with Chinese speaking communities and those working in multicultural environments.

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