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Psychometric properties of long and short forms of the Child Perceptions Questionnaire (CPQ_{11-14}) in a Thai population

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Objectives: The aim of this study was to compare the psychometric properties of different forms of the Child Perceptions Questionnaires (CPQ_{11-14}) for use in Thai adolescents. ***Methods:*** Cross-sectional questionnaire and clinical analytical study conducted at 2 schools in Chonburi province, Thailand. Clinical data were collected for 95 students (64 female, 31 male) aged 11-14 years. Data from the Thai version of CPQ_{11-14} were used to analyze the measurement properties of the original and 4 short forms of the CPQ_{11-14}. ***Results:*** Participants found it difficult to remember that they should assess the impact only in relation to the problems of their teeth, lips, mouth or jaws. The Thai versions of the CPQ_{11-14} have satisfactory internal consistency and test-retest reliability except for the CPQ_{11-14}- ISF:8. The criterion validity of all versions was acceptable except for the CPQ_{11-14}- RSF:8. No CPQ_{11-14} scores correlated with clinical status, otherwise construct validity was acceptable for the original CPQ_{11-14} and the 16-item questionnaires. ***Conclusion:*** The original scale of the CPQ_{11-14} indicates the highest validity and reliability among the 5 forms of the CPQ_{11-14} but has weak relations with clinical data. If it is to be used in low disease populations larger samples will be required. The 16-item questionnaires show some acceptable validity and reliability properties. The findings for the 8-item versions do not support their use in Thailand.

Key words: *children, oral health related quality of life, Child Perceptions Questionnaire*

Introduction

Measures of oral health related quality of life (OHRQoL) have been developed to evaluate the physical, psychological and social impact of oral disease. They aim to measure the extent to which oral diseases interfere with peoples' lives (Brown and Al-Khayal, 2006). To date, relatively little research involved children though a previous study suggested that oral impacts may be higher in children than adults (Jokovic *et al.,* 2002).

Measuring health related quality of life (HRQoL) without reference to a conceptual model has made it difficult to develop a knowledge base for HRQoL research. (Baker *et al.,* 2007: Baker *et al.,* 2008). Therefore, we conducted this study based on the Wilson and Cleary model (Figure 1) which links clinical variables, OHRQoL and psychosocial factors. The model proposes a classification for different measures of health divided into 5 levels: biological and clinical variables, symptoms, functional status, general health perceptions and overall quality of life (Wilson and Cleary, 1995).

Measures for children should be developed especially for them rather than adapting adult measure because their perception of quality of life changes as they develop, they are involved in different activities from adults and their cognitive development may be incomplete (Marshman and Robinson, 2007).

The Child Perceptions Questionnaire (CPQ_{11-14}) was developed specifically for children by Jokovic and colleagues (2002). This self-administered questionnaire comprises 37 items examining 4 domains of oral impact over the past 3 months: oral symptoms, functional limitations, emotional well-being and social well-being. Two questions were added to the questionnaire. First was the global oral health rating used to measure the general health perceptions domain of the Wilson and Cleary model: "Would you say that the health of your teeth, lips, jaws or mouth is….?" The second measured the overall quality of life domain of the model: "How much does the condition of your teeth, lips, jaws or mouth affect your life overall?" These 2 questions have a 5-point response format ranging from "Excellent"=0 to "Poor"=4 for global oral health rating and from "Not at all"=0 to "Very much"=4 for overall quality of life. The psychometric properties of CPQ_{11-14} have been tested in Canada, UK, New Zealand, Saudi Arabia, Hong Kong, Brazil and Denmark (Jokovic *et al*., 2002; Marshman *et al*., 2005; Foster Page *et al.,* 2005; Brown and Al-Khayal, 2006; McGrath *et al*., 2008; Barbosa *et al*., 2009; Wogelius *et al*., 2009). Several versions have been devised; CPQ_{11-14}- ISF:16, CPQ_{11-14}- RSF:16, CPQ_{11-14}- ISF: 8 and CPQ_{11-14}- RSF:8. The CPQ_{11-14}- ISF:16 and CPQ_{11-14}- ISF:8 have 16 and 8 items respectively, both were produced using the item impact method. The CPQ_{11-14}- RSF:16 and CPQ_{11-14}- RSF:8 have 16 and 8 items respectively, both were developed using the regression method.

Four forms of CPQ_{11-14} were developed by Jokovic and colleagues (2006) using the item impact and regression method which asked the children to indicate the importance of each question on a 4-point scale ranging from 0 ("Does not bother me at all") to 3 ("Bothers me very much"). Then the questions were ranked within

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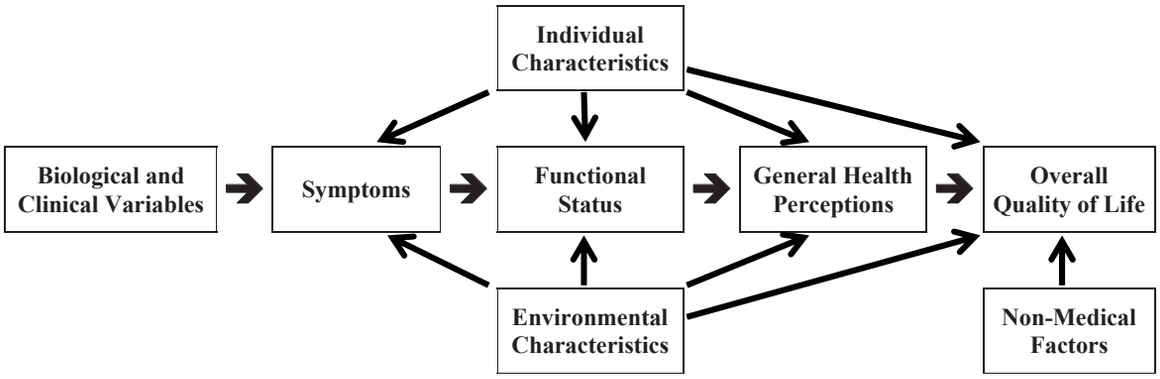

Figure 1. *The Wilson and Cleary model (1995)*

Table 1. High and low values of clinical status

Clinical status	*Low*	*High*
IOTN	IOTN 1-2	IOTN 3-10
No. of missing teeth	No missing teeth	1 or more missing teeth
Missing due to caries	No missing teeth due to caries	1 or more missing teeth due to caries
Filled	No filled teeth	1 or more filled teeth
Decayed	No decayed teeth	Any decayed teeth
DMFT	DMFT= 0	DMFT $\neq$ 0
Enamel deficiency	No enamel deficiency	With enamel deficiency
Gingivitis	No gingivitis	Gingivitis on 1 or more sites

subscales according to their scores. The top 4- and 2- ranked questions in each subscale were selected for CPQ_{11-14}- ISF:16 and CPQ_{11-14}- ISF:8. The regression method was conducted by the development of a single model which included all questions and then a forward stepwise procedure was used to identify the best questions of all. The 4 and 2 questions from each subscale entering the model and making the largest contribution to the coefficient of variation (R^2) were selected for the CPQ_{11-14}- RSF:16 and CPQ_{11-14}- RSF:8, respectively.

Currently, the national health policy for Thailand is the 10th National Health Development Plan (year 2007-2011) which aimed to improve health of Thai people rather than concentrating only on disease (Ministry of Public Health, 2007). In consequence of the plan, the country has included a non-clinical index, an OHRQoL measure, into the 6th national oral health survey for the first time in 2007. The survey used Oral Impacts on Daily Performance (OIDP) for 15 year olds and Child-OIDP for 12 year olds. However, Child-OIDP was developed to measure need rather than health and was intended to aid needs assessment. Furthermore, the measure was developed with an intention to measure severe conditions (Gherunpong *et al.,* 2004) and so may be unsuitable to measure the OHRQoL of Thai children with low DMFT in this study. Thus CPQ_{11-14} which was developed especially for children and was valid for children with various oral conditions was selected. If a valid and reliable form of CPQ_{11-14} is found it may be used to measure OHRQoL of Thai children. To facilitate its use in health surveys and clinical settings short forms could reduce time and financial cost and the risk of non-response items (Jokovic *et al*., 2006). Therefore, a need to compare properties of the CPQ_{11-14} forms in Thai is justified.

None of these forms have yet been tested for use in Thailand, therefore the aim of this study was to compare the psychometric properties of these different forms of the CPQ_{11-14} for use in population-based samples of adolescents in Thailand.

Method

The study was approved by the Ethical Review Committee for Research in Human Subjects: Ministry of Public Health, Thailand and the University of Sheffield Ethics Committee. All children who took part obtained written parental consent. Participants were 11-14 year olds from Anuban Chonburi School and Chonkanyanukul School, Chonburi province, Thailand.

Convenience sampling was used because of its advantages in cost and logistics. Moreover, the intention was to sample a range of students rather than a representative sample. Jokovic and colleagues (2002) found a correlation of 0.54 between the number of decayed teeth and Child Oral Health Quality of Life Questionnaire (COHQOL). A correlation of this magnitude would require a sample size of 22 to be significant at an alpha of 0.01 (Spearman's rank correlation coefficient). Because of cultural differences between Thailand and Canada the correlations may well differ. Therefore, because the calculated sample was modest, we intended to sample 100 people. The study by Marshman and colleagues (2005) in the UK used the same assumptions when validating CPQ_{11-14} with that sample size.

The English version of the CPQ_{11-14} was translated into Thai by the researcher then translated back into English by a Thai linguist having not seen the original English version of $CPQ_{11-14.}$ The 2 English versions were then compared, amendments made and the procedure repeated until there were minimal differences between the 2 versions.

Clinical data were collected by 2 experienced examiners (OG, KD) calibrated to the criteria of the WHO Oral Health Surveys Basic Methods (WHO, 1997). Caries status at the D3 threshold and treatment for each tooth were recorded and DMFT indices were used to describe the dental caries and treatment experience. The aesthetic component of Index of Orthodontic Treatment Need (IOTN) was recorded for malocclusion. This index consists of a visual 10-point scale, which represents a wide range of dental appearance, shown by a series of 10 front view photographs arranged from number 1 most attractive to number 10, least attractive (Brook and Shaw, 1989).

Enamel deficiency which included both general enamel defects and enamel hypoplasia on anterior teeth was recorded as present or absent. Gingival status was recorded as present or absent (Table 1).

The researcher informed the students of the project, gained consent and then asked the children to complete the full version of the CPQ_{11-14} in their classroom. The researcher and calibrated dentist conducted the clinical examinations at the 2 schools using portable dental chairs with lamps. Two weeks later the researcher asked an eligible subgroup of children to complete the second copy of the CPQ_{11-14} to assess test-retest reliability. Data on ethnicity, age and gender were also obtained by asking the children before they were clinically examined. To assess face and content validity the researcher had a discussion with a group of 5 children.

The 4 short forms were not administered independently. The data from the original scale were used to analyze the measurement properties of the original scale and 4 short forms of CPQ_{11-14}; CPQ_{11-14}- ISF:16, CPQ_{11-14}- RSF:16, CPQ_{11-14}- ISF:8 and CPQ_{11-14}- RSF:8.

No participant failed to complete more than one seventh of the questions. This threshold for excluding missing values has been used elsewhere (Marshman *et al.*, 2005; Slade and Reisine, 2007). Therefore, all participants were included in the analysis. Other missing CPQ_{11-14} data were substituted by sample mean scores for that item. This approach to deal with missing values was described by Marshman and colleagues (2005).

Total CPQ_{11-14} scores for each participant were calculated by summing the response codes for the questionnaire items. For the purpose of analysis, 2 summary scores of the various forms of the CPQ_{11-14} were created; symptoms scores and functional status scores. The symptoms scores contained items 1-6 of the original scale while the functional status scores contained items 7 to 37 of the original scale. These 2 summary scores represented the symptoms and functional status domains of the Wilson and Cleary model (Figure 1). The internal consistency of all 5 forms of CPQ_{11-14} was assessed by means of Cronbach's alpha. Test-retest reliability of all forms was assessed using the Intraclass Correlation Coefficient (ICC) for participants whose oral status was unchanged between the 2 administrations of the questionnaire. Validity of the forms of CPQ_{11-14} was assessed in relation to clinical data, general health perceptions and overall quality of life for which questions are included in CPQ_{11-14}. Due to the low prevalence of disease in the sample, all clinical variables were dichotomised into 'high' and 'low' values as described in Table 1.

Convergent validity was assessed by comparing mean total CPQ_{11-14} values of all 5 versions by gender. The independent samples t test was used for analysis. Data were analyzed using the SPSS for Windows version 15.0.

Results

One hundred young people were invited to take part in the study. No young people were unable to complete the questionnaire. One declined to take part and 2 were absent from school on the day the first copies of the questionnaires were completed. Thus 97 students completed the first copies of $CPQ_{11-14.}$ One student was absent on the day the second copies were completed. Another had a tooth filled during the study period. Data are thus presented for the 95 people who provided both data. None were excluded due to excessive missing data.

The sample of 95 comprised 45 attending Anuban Chonburi School and 50 attending Chonkanyanukul School, a girls' school. The mean age of participants was 11.3 years (central 95% range 11-12); 64 female, 31 male; 53 Thai, 40 Thai-Chinese.

Discussion with participants revealed an important point about the questionnaire: despite regular reminders they found it difficult to remember that responses should only concern aspects related to their teeth, lips, jaws or mouth.

Mean numbers of decayed, missing and filled teeth was 1.7 (SD=2.4). This value was almost equally divided between decayed and filled teeth (mean=0.8, SD=1.5 and mean=0.9, SD=1.7 respectively) with very few teeth missing (mean=0.01, SD=0.1). Of the participants, 54% had an IOTN (Aesthetic Component) of <4 and 81% had gingivitis.

Scores for all 5 versions of CPQ_{11-14} are described in Table 2. Floor effects were almost non-existent and there were no ceiling effects on any of the forms. The mean level of impact identified by the 16-item questionnaires differed by only 1 point, while the 8-item versions yield almost identical scores.

Approximately half (53 %) of the young people said that the health of their teeth, lips, jaws or mouth (global oral health rating) was 'good' in the prior 3 months. The condition of their teeth lips, jaw or mouth affected 1% of participants 'a lot' and none were affected 'very much' (overall quality of life).

Reliability data, for all versions are shown in Table 3. The CPQ_{11-14} and the 16-item questionnaires indicate substantial internal consistency while the 8-item questionnaires showed lower Cronbach's alpha values. The ICC for the CPQ_{11-14} and for all the short forms of CPQ_{11-14} suggest moderate test-retest reliability (Landis and Koch, 1977) but were lowest for CPQ_{11-14} - ISF:8 (Table 3).

Acceptable criterion validity was indicated for all forms of the total CPQ_{11-14} score, except for CPQ_{11-14}- RSF:8, by correlation with global oral health rating (Table 4).

Table 2. Descriptive statistics: all forms of the CPQ_{11-14}

	Range of possible values	*Mean (SD)*	*Range of scores*	*% with min score*	*% with max score*
CPQ_{11-14}	0-148	24.3 (12.6)	1-61	0	0
CPQ_{11-14}- ISF:16	0-64	13.4 (6.1)	1-29	0	0
CPQ_{11-14}- RSF:16	0-64	14.1 (6.4)	1-31	0	0
CPQ_{11-14}- ISF:8	0-32	6.8 (3.3)	1-14	0	0
CPQ_{11-14} - RSF:8	0-32	6.9 (3.5)	0-15	3	0

Table 3. Reliability statistics: all forms of the CPQ_{11-14}

	Internal consistency Cronbach's alpha	*Test-retest reliability Intraclass correlation coefficient*
CPQ_{11-14}	0.9	0.6
CPQ_{11-14} - ISF:16	0.7	0.6
CPQ_{11-14}- RSF:16	0.7	0.6
CPQ_{11-14} - ISF:8	0.5	0.5
CPQ_{11-14} - RSF:8	0.5	0.6

Table 4. Rank correlations between formulations of the CPQ_{11-14} and global oral health rating

	CPQ_{11-14}	CPQ_{11-14} - ISF :16	CPQ_{11-14}- RSF :16	CPQ_{11-14} - ISF :8	CPQ_{11-14} - RSF :8
Total CPQ	0.3*	0.3*	0.3*	0.3*	0.1
Symptoms	0.1	0.3*	0.3*	0.2*	0.1
Functional limitations	0.3*	0.3*	0.2	0.3*	0.0
Emotional well-being	0.4*	0.3*	0.3*	0.2	0.2
Social well-being	0.1	0.0	0.1	0.0	0.0

*= statistically significant, $p<0.05$, Spearman's rank correlation coefficient

Table 5. Correlations between total CPQ_{11-14} scores and overall quality of life (n=95) and between symptoms and functional status subscales

	Overall quality of life	*Symptoms and functional status subscales*
CPQ_{11-14}	0.4*	0.5*
CPQ_{11-14}- ISF:16	0.4*	0.4*
CPQ_{11-14}- RSF:16	0.4*	0.4*
CPQ_{11-14}- ISF:8	0.4*	0.2
CPQ_{11-14} - RSF:8	0.3*	0.1

* =statistically significant, $p<0.05$, Spearman's rank correlation coefficient

Construct validity was assessed by testing the link between CPQ_{11-14} scores and both clinical data and overall quality of life.

Clinical data were dichotomised into 'high' and 'low' scores for each variable as described in Table 1. Clinical data were in general not related with the measures, except the symptoms subscale of CPQ_{11-14} which was associated with the presence of enamel defects ($r_s = 0.20$, $p<0.05$) (data available on request to the author).

All versions of the questionnaires demonstrated positive correlations with overall quality of life (Table 5).

There were some correlations between symptoms and functional status subscales for the original scale and the 16-item questionnaires but none among the 8-item questionnaires (Table 5). Scores for all versions of CPQ_{11-14} did not differ by gender (t test, data available on request to the author).

Discussion

This study aimed to assess the properties of all 5 versions of the CPQ_{11-14} to assess OHRQoL in population-based samples of adolescents in Thailand. In general, the internal consistency and test-retest reliability and criterion validity was greater in the original and 16-item forms. However, none of the forms were consistently related to the clinical status of the mouth. These data are consistent with other studies reporting use of CPQ_{11-14} (Jokovic *et al.,* 2002: Marshman *et al.,* 2005) although few of these studies have compared all 5 forms.

The test-retest reliability of the Thai version of CPQ_{11-14} was lower than in the UK (0.83) (Marshman *et al.,* 2005) and a Canadian study (0.90) (Jokovic *et al.,* 2002). The test-retest reliability varies depending on the version used and the between-subject variability. Low levels of between-subject variability may lower the values even when the difference in scores between baseline and follow up scores is low (Weir, 2005).

All versions of the CPQ_{11-14} were correlated with global oral health ratings, indicating acceptable criterion validity except for CPQ_{11-14}- RSF:8. Similar findings were found in the Canadian study of short forms of the CPQ_{11-14} (Jokovic *et al.,* 2006).

There are three explanations for the tenuous link between clinical data and the health outcomes in this study. First, CPQ_{11-14} may not detect the health outcomes of oral disorders. Secondly, clinical examinations which evaluate oral diseases and OHRQoL questionnaires do not measure closely related domains. Not all oral disease contributes to health, particularly in a low disease population (DMFT=1.7 in this sample). The validation study in the UK, also conducted within a low disease population (DMFT=1.3) had similar findings between clinical data and overall quality of life (Marshman *et al.,* 2005). In addition, dental caries (much of which was treated) is not life threatening and may not cause a huge impact on quality of life. Moreover, even when the study is conducted in a sample with severe oral conditions, the extent of impact can be influenced by other important factors such as gender, age and a range of psychosocial factors (Baker *et al.,* 2006). A third explanation of the weak link between clinical and subjective data is that the correlations are subtle and the sample size too small to detect them. Therefore, it could be argued that one possible effect of the small sample size is the effect on apparent construct validity. This argument is supported by data from the Australian and New Zealand studies with CPQ_{11-14} whose larger samples were able to detect relationships between CPQ_{11-14} scores, DMFS and dental fluorosis (Do and Spencer, 2007; Foster Page, 2005). These explanations are not mutually exclusive and several may apply.

Only the symptoms subscale score of CPQ_{11-14} was associated with the presence of enamel deficiency. It is possible that this result is due to type I error. The UK study findings also found a weak relationship between CPQ_{11-14} and clinical status with an association between the presence of enamel deficiency and the functional limitations subscale scores (Marshman *et al.,* 2005). However, the common finding between these 2 studies suggests that there may indeed be a relationship and this warrants further investigation. In addition, such a relationship was observed in the large Australian study of quality of life in relation to caries and fluorosis experience (Do and Spencer, 2007).

The study found no relationship between the aesthetic component of the IOTN and CPQ_{11-14} scores. This relationship was not examined in the UK or the Canadian study (Marshman *et al*., 2005; Jokovic *et al.,* 2002). All versions of the CPQ_{11-14} were correlated with overall quality of life but not all forms were related to general health perceptions. There may be more correlations between CPQ_{11-14} scores and overall quality of life because the items of these 2 scales have similar structure.

There were no relationships between the symptoms subscales of the original version with general health perceptions. It may be that the relationship was not significant because there was only one question regarding health perceptions and therefore, it might not be reliable enough to detect this complex domain. However, single-item global ratings have been frequently used to assess construct validity for OHRQoL measures (Locker, 2009).

One possible weakness of the study is that the short forms were not administered independently. The study used data collected from the original questionnaire to evaluate the psychometric properties of the short forms. The children may complete the questionnaires differently if the forms were administered independently. However, Schofield and Mishra (1998) did not find any differences when the SF-12 was administered independently and when it was administered as a part of the SF-36.

To conclude, the original scale of the CPQ_{11-14} indicates the highest validity and reliability among the 5 forms of the CPQ_{11-14} in this sample but has poor correlations with clinical data. Hence, its suitability for use in low disease populations in Thailand needs consideration. If it is to be used in low disease populations larger samples will be required. Validation of the CPQ_{11-14} in higher DMFT populations such as in the rural Thailand may be needed.

The 16-item questionnaires show acceptable validity and reliability. However, these are preliminary findings based on a convenience sample. Therefore, a further validation of the 16-item questionnaires may be needed. The findings on the 8-item versions particularly in relation to test-retest reliability and criterion validity do not support their use.

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