

Evaluation of oral health-related quality of life questionnaires in a general child population

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Background: The evaluation of instruments measuring oral health-related quality of life (OHRQoL) of children has been largely among convenience samples of patients with specific diseases or disorders such as cleft lip/cleft palate or malocclusion. **Aim:** This study aimed to evaluate the consistency and validity of the recently developed Child Perception Questionnaires (CPQ_{8–10} and CPQ_{11–14}) and the corresponding Parental Perception Questionnaire (PPQ) in a general child population sample in South Australia. **Methods:** The study was nested in the Child Oral Health Study. Some 1401 children aged 8 to 13 in 2002/03 were approached. Children were asked to complete the CPQ_{8–10} and CPQ_{11–14} according to their age while parents completed the PPQ. The questionnaires included global ratings of oral health and overall well-being. Scores for four domains (oral symptoms, functional limitations, emotional well-being and social well-being) were calculated. Data on caries experience (number of decayed, missing and filled tooth surfaces) and occlusal traits (using Dental Aesthetic Index) were collected for each child. **Results:** The CPQs and PPQ showed acceptable internal consistency and construct validity against global ratings of oral health and overall well-being. Children who had more caries or less acceptable occlusal traits reported poorer OHRQoL establishing the discriminant validity of the instruments. Parents of the children reported similar child OHRQoL. **Conclusion:** These results suggest that the instruments have consistency and validity in measuring OHRQoL of children in a general population.

Key words: Children, general population, oral health-related quality of life.

Introduction

Measurement of oral health-related quality of life (OHRQoL) has emerged as an important indicator of health (Cohen 1997). OHRQoL documents functional and psychosocial outcomes of oral diseases and conditions. A number of OHRQoL instruments have been developed to be used among the adult population (Atchison and Dolan 1990; Locker and Miller 1994; Slade and Spencer 1994; Leao and Sheiham 1996). Those instruments, together with clinical indicators of oral health, have provided comprehensive accounts of the oral health of adult individuals and populations.

The use of OHRQoL measures for children has lagged behind its use for adults because instruments specifically for children were lacking. Parents were often used as a proxy to collect OHRQoL of children. However, this approach cannot always produce reliable information (Jokovic et al. 2004a). Recently, an instrument has been designed to collect OHRQoL data directly from children themselves (Jokovic et al. 2002; 2003; Jokovic et al. 2004b). Two questionnaires were designed for use among children aged 8–10 years (CPQ_{8–10}) and 11–14 years (CPQ_{11–14}). A corresponding questionnaire (PPQ) was designed to collect information from parents. The questionnaires include four domains of OHRQoL: oral symptoms (e.g. pain), functional limitation (e.g. eating difficulty), emotional well-being (e.g. avoiding smiling), and social well-being (e.g. being teased by other children).

The validity and reliability of the questionnaires have been examined mostly in convenience samples of children

attending dental clinics (Jokovic et al. 2002; Jokovic et al. 2004b; Marshman et al. 2005). One study using the CPQ_{11–14} in a random sample of New Zealand children reported acceptable construct validity of the instrument (Foster Page et al. 2005). The CPQ_{11–14} was also used as a translated version in a sample of Ugandan school children (Robinson et al. 2005). The CPQ_{8–10} has not been tested in general population settings.

This study aimed to evaluate the consistency and validity in the use of the Child Perception Questionnaires for 8–10 and 11–14 year olds and Parental Perception Questionnaire in a random sample of the general child population of South Australia.

Methods

The study sample was nested in a large population-based study of the South Australian (SA) School Dental Service (SDS) population. The SA SDS population comprises 89% of the state's child population. The parent study targeted children aged 5 to 15 years using a multi-stage, stratified random sample selection. The first stage of stratification was urban/rural residence, while the second stage was fluoridation status. Children in each stratum were sampled with different sampling ratios. Information on fluoride exposure history, socio-demographic status and caries experience was sought in the parent study. All participants of the parent study who were 8 to 13 years of age in 2002/03 from metropolitan, fluoridated Adelaide and three other regional non-fluoridated towns were selected for the further study of oral health-related quality of life among children. Ethical approval was re-

ceived from the University of Adelaide Human Research Ethics Committee.

Children and their parents were approached with a package containing an information letter, a consent form and questionnaires. Children received an age-specific child questionnaire (CPQ₈₋₁₀ or CPQ₁₁₋₁₄) based on age of the child while parents were asked to complete a parental questionnaire. Items of the CPQ and PPQ used Likert-type scales with response options were “Never”=0; “Once or twice”=1; “Sometimes”=2; “Often”=3; and “Very often”=4. For the CPQ₁₁₋₁₄ and PPQ the recall period was three months while that of the CPQ₈₋₁₀ was four weeks. Domain scores of the CPQs and PPQ were calculated by summing all the responses to items in the domains. Lower domain scores indicate better OHR-QoL. Since the number of items differed between CPQs and PPQ, the sums of domain scores were comparable within each questionnaire only. The questionnaires also contained a global question of oral health with a Likert-type responses from “Excellent” to “Poor”, and a global question of overall well-being rating from “Not at all” to “Very much”.

Dental caries data extracted from SDS clinical records and measures of occlusal traits collected at a clinical examination were also used in this analysis. The clinical record of each child’s dental caries experience was collected from dental visits to SA SDS clinics. These data were used to calculate the prevalence of caries and decayed, missing and filled primary and permanent (dmf/DMF) tooth surface scores. Caries experience was categorised as low (having 0 or 1 deciduous or permanent surface with caries experience: decayed, missing or filled) and high (having two or more deciduous or permanent surfaces with caries experience).

Children were invited to be examined by one of the authors (LGD) at their local SDS clinic for fluorosis and occlusal traits. Prior to the fieldwork, the examiner underwent training sessions with epidemiologists who were experienced with the clinical indices. Occlusal traits were measured using the Dental Aesthetic Index (DAI) (Cons et al. 1986). The DAI assesses the relative social acceptability of dental appearance using a weighted measure of 10 occlusal traits. The DAI score can range from 13 (most socially acceptable) to 100 (least socially acceptable). The severe and handicapping arbitrary categories are from 32 to 35 and 36+ respectively (Estioko et al. 1994). DAI score was used to categorise children into having more acceptable occlusal traits (DAI score from 13 to 31) and having less acceptable occlusal traits (severe or handicapping: DAI score of 32 and higher).

Unweighted data were used in the analysis. Response to domains of each questionnaire was evaluated for internal consistency, i.e. consistency between items in a domain. Internal consistency of the domains was evaluated by means of Cronbach’s alpha using one-way random effect modelling. Construct validity was evaluated by determining the association between domain scores and responses to the two global questions of oral health and overall well being. Spearman’s rank correlation was used to test the construct validity of the domains. Discriminant validity was assessed by comparing domain scores of the groups by caries experience and DAI scores using independent t-tests.

Results

A total of 1,401 children and parents were sampled. Some 842 parent/child pairs responded with completed questionnaires, resulting in an adjusted response of 65.7%. There were 374 CPQ₈₋₁₀ and 468 CPQ₁₁₋₁₄ completed questionnaires. Some 372 parent/child pairs were from metropolitan Adelaide and other 470 were from regional areas. There was no significant difference in terms of gender and residency distribution among CPQ₈₋₁₀ and CPQ₁₁₋₁₄ respondents. The characteristics of the sample were compared with those of the state child population (Table 1). Comparison of gender distribution and caries experience between study respondents and the state child population revealed no statistically significant difference.

The internal consistency of the four domains was tested for the three respondent groups using Cronbach’s alpha (Table 2). Cronbach’s alpha values ranged from 0.63 to 0.91. The oral symptom domain had lower internal consistency as compared to the other domains. There was a similar pattern of internal consistency between children and their parents.

Table 3 presents descriptive statistics for the respondent groups. The parent group was divided into two groups by their corresponding child questionnaire. The overall scores and subscale scores showed substantial variability. Overall scores of all three instruments had some floor effect (score=0) while there was no ceiling effect (maximum score). Higher domain scores or poorer OHRQoL were obtained for oral symptoms, while the lowest scores were reported for social well-being. Similarly for all instruments, oral symptoms had low floor effect while social well-being had the highest floor effect. Few children in the 8–10-year-old group had a ceiling effect in oral symptoms and emotional well-being domains.

The construct validity of the CPQs and PPQ was tested by means of Spearman’s Rank correlation with the global ratings of oral health and overall well-being (Table 4). Each of the domains in child and parental perception of oral health had a significant correlation against the respective global rating of oral health. These correlations ranged from a weak strength of 0.20 to a moderate strength of 0.38. Children’s global rating of their oral health was relatively strongly correlated with oral symptoms and emotional well-being, while correlation between parental ratings of their child’s oral health and social well-being was relatively stronger. All domains of both the child and parent perception of oral health-related quality of life were also significantly correlated with the global rating of overall well-being. The rank correlations were slightly stronger than those with the global rating of oral health, but were predominantly moderate in strength. Again, correlation of the child’s ratings of his/her overall well-being with oral symptoms and emotional well-being was relatively strong compared with the other domains.

Discriminant validity was tested for groups with different levels of caries experience and acceptability of occlusal traits (Table 5). Discriminant validity varied between groups of respondents by type of questionnaire. The four domains also showed variation. Children 8–10 years old who had high caries experience generally had

Table 1. Comparison of the study sample and the state child population

	<i>Study sample</i> <i>Aged 8–13 yo</i>	<i>SA population</i> * <i>Aged 8–13 yo</i>
<i>Urban group</i>		
% Female	49.4%	49.0%
Mean dmfs	1.79 (3.79)	1.79 (3.66)
Mean DMFS	0.92 (1.93)	0.80 (1.86)
<i>Rural group</i>		
% Female	49.5%	49.1%
Mean dmfs	2.98 (5.04)	2.53 (4.33)
Mean DMFS	1.06 (2.18)	0.93 (1.96)

* Data extracted from the electronic data management system EXACT of children attending SDS who comprise 89% of the state child population

Table 2. Internal consistency of domains of each questionnaire

	<i>CPQ₈₋₁₀</i>		<i>CPQ₁₁₋₁₄</i>		<i>PPQ</i>	
	<i>n of items</i>	<i>Cronbach's alpha</i>	<i>n of items</i>	<i>Cronbach's alpha</i>	<i>n of items</i>	<i>Cronbach's alpha</i>
Oral symptom	5	0.65	6	0.68	6	0.63
Functional limitation	5	0.75	7	0.76	7	0.74
Emotional well-being	5	0.88	8	0.91	8	0.87
Social well-being	10	0.75	10	0.86	10	0.87

One-way random effect parallel model, $p < 0.01$ for all domains

Table 3. Descriptive statistics of the CPQ and PPQ overall scores and the four domains

<i>Domains (n of items)</i>	<i>Mean (SD)</i>	<i>Range</i>	<i>Floor effect</i> ^a	<i>Ceiling effect</i> ^b
CPQ ₈₋₁₀ overall score (25)	10.7 (9.5)	0–60	3.0	0.0
Oral symptom (5)	5.2 (3.2)	0–20	4.6	0.3
Functional limitation (5)	1.9 (2.7)	0–17	44.2	0.0
Emotional well-being (5)	2.3 (3.6)	0–20	49.1	0.5
Social well-being (10)	1.4 (2.6)	0–21	56.2	0.0
CPQ ₁₁₋₁₄ overall score (31)	13.3 (12.9)	0–77	3.0	0.0
Oral symptom (6)	5.3 (3.4)	0–20	3.9	0.0
Functional limitation (7)	3.1 (3.9)	0–18	34.7	0.0
Emotional well-being (8)	2.9 (4.8)	0–27	44.3	0.0
Social well-being (10)	1.9 (3.6)	0–21	48.7	0.0
PPQ ₈₋₁₀ overall score (31)	11.6 (11.2)	0–61	3.5	0.0
Oral symptom (6)	5.0 (3.1)	0–15	6.0	0.0
Functional limitation (7)	2.8 (3.8)	0–19	39.7	0.0
Emotional well-being (8)	2.3 (3.8)	0–24	51.9	0.0
Social well-being (10)	1.5 (3.2)	0–18	63.9	0.0
PPQ ₁₁₋₁₄ overall score (31)	12.4 (12.6)	0–85	3.9	0.0
Oral symptom (6)	4.7 (3.3)	0–22	6.9	0.0
Functional limitation (7)	3.0 (3.8)	0–22	38.0	0.0
Emotional well-being (8)	2.6 (4.5)	0–29	53.3	0.0
Social well-being (10)	2.0 (3.7)	0–23	54.6	0.0

Sum of items' scores in a domain

CPQ₈₋₁₀ estimates are not directly comparable with estimates of the other two questionnaires because of difference in numbers of items in domains

^a Floor effect: Proportion with 0 score

^b Ceiling effect: Proportion with maximum score.

Table 4. Construct validity: Rank correlation between domain scores and the two global ratings of oral health and overall well-being

	<i>CPQ₈₋₁₀</i>	<i>CPQ₁₁₋₁₄</i>	<i>PPQ₈₋₁₀</i>	<i>PPQ₁₁₋₁₄</i>
<i>with the global rating of oral health</i>				
Oral symptoms	0.37	0.37	0.25	0.33
Functional limitations	0.28	0.31	0.27	0.32
Emotional well-being	0.36	0.38	0.24	0.28
Social well-being	0.20	0.31	0.26	0.33
<i>with the global rating of overall well-being</i>				
Oral symptoms	0.38	0.32	0.35	0.27
Functional limitations	0.29	0.31	0.27	0.31
Emotional well-being	0.39	0.39	0.43	0.36
Social well-being	0.25	0.35	0.32	0.28
Spearman's Rank Correlation Coefficient				
p<0.05 for all domains				

Table 5. Discriminant validity (mean domain scores (SD) by different groups by caries and dental appearance

		<i>Oral symptoms</i>	<i>Functional limitations</i>	<i>Emotional well-being</i>	<i>Social well-being</i>
<i>By caries experience</i>					
<i>CPQ₈₋₁₀</i>	Low caries	5.2 (3.2)	1.7 (2.2)	1.9 (3.3)	* 1.1 (1.7)
	High caries	5.2 (3.3)	2.0 (2.9)	2.4 (3.7)	1.7 (3.1)
<i>CPQ₁₁₋₁₄</i>	Low caries	* 4.9 (3.2)	* 2.7 (3.5)	2.5 (4.5)	1.7 (3.6)
	High caries	5.9 (3.7)	3.8 (4.3)	3.4 (4.9)	2.3 (3.5)
<i>PPQ₈₋₁₀</i>	Low caries	* 4.5 (2.9)	2.5 (3.7)	1.7 (3.1)	* 0.8 (2.0)
	High caries	5.3 (3.0)	2.8 (3.5)	2.3 (3.7)	1.8 (3.7)
<i>PPQ₁₁₋₁₄</i>	Low caries	* 4.2 (3.0)	2.5 (3.8)	2.2 (4.6)	1.6 (3.6)
	High caries	5.0 (3.2)	3.3 (3.8)	3.1 (4.2)	2.2 (3.6)
<i>By DAI score on social acceptability of dental appearance</i>					
<i>CPQ₈₋₁₀</i>	More acceptable	5.0 (3.2)	1.6 (2.3)	* 1.6 (2.5)	* 1.0 (1.9)
	Less acceptable	5.7 (2.9)	2.1 (2.7)	2.5 (3.8)	1.7 (2.9)
<i>CPQ₁₁₋₁₄</i>	More acceptable	5.2 (3.3)	* 2.5 (3.3)	* 2.4 (4.2)	1.6 (3.4)
	Less acceptable	5.5 (3.4)	4.2 (4.3)	3.7 (5.1)	2.2 (3.5)
<i>PPQ₈₋₁₀</i>	More acceptable	5.0 (3.1)	2.6 (3.7)	* 1.7 (3.1)	1.1 (2.7)
	Less acceptable	5.0 (3.0)	2.7 (3.5)	2.6 (4.0)	1.6 (3.5)
<i>PPQ₁₁₋₁₄</i>	More acceptable	4.4 (3.0)	* 2.5 (3.2)	* 2.2 (4.0)	1.6 (3.4)
	Less acceptable	5.0 (3.2)	3.8 (4.8)	3.3 (5.0)	2.3 (4.0)

Caries: Low: ≤1 decayed, missing filled deciduous or permanent tooth surfaces
High: 2+ decayed, missing filled deciduous or permanent tooth surfaces

Occlusal traits: More acceptable: DAI score from 13 to 31
Less acceptable: DAI score 32+

* Independent t test, column comparison, p<0.05

Lower values depict better OHRQoL

higher domain scores, i.e. poorer OHRQoL, compared with children who had lower caries experience. The difference was significant for the social well-being domain. Parents of 8–10-year-old children who had more caries had significantly higher domain scores for oral symptoms and social well-being. Children of the younger age group who had less acceptable dental appearance had poorer OHRQoL on the four domains. The differences were significant for the emotional well-being and social well-

being domains. Parents of those children also had higher domain scores, which was significant for the emotional well-being domain.

The 11–13-year-old children group who had higher caries experience or less acceptable occlusion and their parents also reported poorer OHRQoL. Children who had more caries experience reported significantly more oral symptoms and more functional limitations. Parents of those children generally had higher domain scores

compared to parents of children who had less caries experience. The difference was significant for the oral symptoms domain. There was a tendency for children who had less acceptable dental appearance and their parents to report poorer OHRQoL compared to the group with more acceptable dental appearance. The differences were significant for the functional limitations and emotional well-being domains.

Discussion

The sample for this study was not a sample of patients with a particular oral condition as has been the case in most previous testing of the CPQ and PPQ questionnaires. In contrast, this study employed a complex sampling strategy aimed at obtaining a more diverse sample of the general population. The study sample did not represent a simple random sample of the child population in South Australia, as regional children were over-represented. There was no attempt to re-weight the data prior to testing internal consistency and validity because population representativeness of a sample is not required for the testing of these properties of questionnaires. However, the study sample was a general population sample, with diverse oral health status and frequency of use of dental services. Characteristics of the study sample within urban or rural groups were similar to those of the state child population.

Caries experience and measures of occlusal traits that were combined to express the acceptability of dental appearance were used as clinical indicators to achieve the main objective of the study: to evaluate the OHRQoL questionnaires in a general population. Caries and dental appearance are frequently used indicators of oral health and relate to OHRQoL. Use of these two clinical indicators in the evaluation of the questionnaires helped increase the transferability of the study findings.

The study showed that the CPQs and PPQ had acceptable internal consistency as well as construct and discriminant validity. The internal consistency of the domains had a pattern similar to that reported at the initial testing of the questionnaires (Jokovic et al. 2002; 2003; Jokovic et al. 2004b). The internal consistency of the oral symptoms domain was relatively lower. This might be explained by the fact that the questionnaires contain items related to oro-facial deformity such as cleft lip/cleft palate, which is rare in the general population. An item such as "Food caught in the top of your mouth" was very rarely responded to with a positive score. The construct validity measured by rank correlation with the global rating of oral health and overall well-being was moderate. However, the construct validity reported in this study was better than that reported in the initial testing of the questionnaires (Jokovic et al. 2002; Jokovic et al. 2004b; Marshman et al. 2005).

The questionnaires showed acceptable discriminant validity, despite the sample being a general population sample rather than a sample of children with a specific oral condition. Children who had higher caries experience and less socially acceptable dental appearance and their parents reported poorer OHRQoL compared with the group who had better clinical indicators. Patterns of the associations were similar between children and their parents.

The fact that the sample was drawn from the general population, i.e. without a specific oral condition, was reflected in the results of the instruments. There was a substantial proportion of children and parents who reported a floor effect, especially on the functional limitations, emotional well-being and social well-being domains. This fact may point to a need of a modified, short version of CPQ and PPQ to be used among general population.

The CPQ₈₋₁₀ was designed to suit the cognitive ability of 8–10-year-old children. Children as young as 8 to 10 years old were found to almost universally understand the nature of the task and basic terms presented to them (Rebok et al. 2001). The CPQ₈₋₁₀ used a four-week recall period, which would further enhance the performance of the children (Rebok et al. 2001). However, there was evidence that some young children had a tendency to use extreme responses (floor or ceiling effect). The young children in this study did not discriminate the impact of differing levels of caries experience. This finding was similar to that reported by the authors of the instrument in the evaluation process (Jokovic et al. 2004b). In this study, that null result might be explained by the fact that these young children mostly had deciduous caries experience, which was considerably higher than permanent decay experience of the older children. The cut-off point used to dichotomise caries experience in this study might not be appropriate for these young children. Another dichotomy of the caries experience at a higher cut-off point might be more suitable to discriminate OHRQoL by caries experience among those young children. The impact of deciduous caries experience may also be less pronounced than that of permanent caries experience.

Children and their parents were consistent in reporting OHRQoL in regards to occlusal traits and dental appearance. The emotional well-being domain scores were significantly lower (better perception) among groups with a more acceptable dental appearance. This result indicated high level of awareness of and desire to have good dental appearance among young children and their parents.

Overall, the CPQs and PPQ demonstrated acceptable internal consistency and validity in measuring oral health-related quality of life of children in a general population. These instruments can have use in a range of areas: 1) to document the social impact of oral disease and disorder; 2) to prioritise dental care; 3) to measure outcome of treatment; and 4) to plan and evaluate different strategies and programmes to improve oral health. Future research as a result of this study includes following up the sample to measure change of oral health status and OHRQoL over time.

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