Questionnaire for Measuring Oral Health-related Quality of Life in Eight- to Ten-year-old Children

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Abstract

Purpose: This study measured oral health-related quality of life for children, which involved the construction of child perceptions questionnaires (CPQs) for ages 6 to 7, 8 to 10, and 11 to 14. The purpose of this study was to present the development and evaluation of the CPQ for 8- to 10-year-olds (CPQ_{8-10}).

Methods: Questions (N=25) were selected from the CPQ for 11- to 14-year-olds based on the child development literature and input from parents, child psychologist, and teacher of grades 3 and 4 . Validity and reliability were evaluated on 68 and 33 children, respectively.

Results: There was a positive moderate correlation between the CPQ_{8-10} score and overall well-being rating (R=.45). The level of impact was slightly higher in the orofacial than in the pediatric dentistry group (mean score=19.1 vs 18.4, respectively). Hypotheses concerning the relationship between the CPQ_{8-10} score and number of decayed surfaces were confirmed with R=.29, and the mean score higher in caries-afflicted than caries-free children (21.1 vs 14.7). The Cronbach's alpha and intraclass correlation coefficients were 0.89 and 0.75, respectively.

Conclusions: Results suggest good construct validity, internal consistency, reliability and test-retest reliability, but do not demonstrate discriminative validity. This is consistent, however, with theoretical models of oral disease and its consequences. Further research is required, as these are preliminary findings based on convenience sampling. (*Pediatr Dent.* 2004;26:512-518)

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Oral health-related quality of life (OHRQoL) measures document the functional and psychosocial outcomes of oral disorders. It is now generally accepted in the research community that they are as essential as clinical indicators when assessing the oral health of individuals and populations, making clinical decisions, and evaluating dental interventions, services, and programs.

Several OHRQoL measures for adults have been developed.[1-5] They are being used with increasing frequency in oral health surveys and clinical trials to complement clinical indicators in order to obtain a comprehensive account of treatment needs and outcomes.

The only OHRQoL measure currently available for children is the Child Oral Health Quality of Life Questionnaire (COHQoL).[6-8] This is a measure of the impact of oral and orofacial conditions on the functional, emotional, and social well-being of children ages 6 to 14 years and their families. It conforms to the World Health Organization's (WHO) definition of health and the contemporary conceptualization of child health as "…the physical, emotional, and social functioning of the child and, when indicated, his or her family…" (American Academy of Pediatrics, 1984; American Cancer Society, 1995).

The COHQoL was intended to incorporate both parental and child perceptions, and be sensitive to children's cognitive, emotional, and social development. Age-specific self-report measures were required to accommodate differences in children's self-concept, understanding of feelings, and ability to interpret other people's behavior across the 6- to 14-year age range.[9,10] According to theory and research

Table 1. Characteristics of Children

	Validity study		Test-retest reliability study	
	N	%	N	%
Clinical group				
Pediatric dentistry	42	62	18	55
Orofacial	26	38	15	46
Gender of child				
Boy	39	57	19	58
Girl	29	43	14	42
Age of child				
8 yrs	18	27	8	24
9 yrs	23	34	12	36
10 yrs	27	40	13	39
Mean (±SD)	9.1±0.8		9.2±0.8	

in child psychology, the age groups 8 to 10 years and 11 to 14 years are homogenous in terms of children's cognitive, emotional, social, and language development.[9,10]

Accordingly, the authors planned to construct 5 measures for the COHQoL:

1. parental perceptions questionnaire (PPQ) that assessed impact from the parent perspective;
2. family impact scale (FIS) that assessed impact on the family;
3. child perceptions questionnaires (CPQ) for children 6 to 7 years of age (CPQ_{6-7}), 8 to 10 years of age (CPQ_{8-10}), and 11 to 14 years of age (CPQ_{11-14}) that assessed impact from the child's perspective.

To date, the PPQ, FIS, and CPQ_{11-14} have been developed and evaluated for validity and reliability. The results indicated that they have excellent psychometric properties.[6-8]

These questionnaires were constructed using a systematic multistage process based on the theory of measurement and scale development.[11,12] The procedures for the development and evaluation of HRQoL measures described by Guyatt et al[13] and Juniper et al[14] were followed.

The objective of this study was to describe the development of the CPQ for children ages 8 to 10 years (CPQ_{8-10}) and to present study results to evaluate its validity and reliability.

Methods

Participants

Study participants were children ages 8 to 10 years who did not have systemic and/or mental developmental disorders and who were fluent in English. Convenience samples were recruited from patient populations attending public health dental clinics in the York Region, Ontario, Canada and the orthodontic clinic of the craniofacial unit at The Hospital for Sick Children, Toronto, Ontario. They are referred to in this study as the pediatric dentistry group and orofacial group, respectively.

The first group targeted children with dental caries, and the second group targeted children with clefts of the lip and palate. They were chosen because they are the most prevalent oral conditions in 8- to 10-year-olds. In addition, they have distinct clinical characteristics that are expected to have a different effect on children's quality of life.

The study was approved by the Human Subjects Certification Committee, University of Toronto and the Research Ethics Board, The Hospital for Sick Children, Toronto. A parental written consent was obtained prior to seeking a child's verbal assent. A child's dissent superseded the parental consent.

Development process

Questions for the CPQ_{8-10} were selected from the CPQ_{11-14} The child development literature and judgments of a child psychologist, grades 3 and 4 teacher, and group of parents provided the basis for this selection. Questions were reworded for 8-year-olds by consulting writers of children's manuals[15] and a teacher of grades 3 and 4. The teacher also helped choose the recall period and response options, write instructions, and format a self-completed questionnaire. Grammar and language difficulty were further assessed with 2 readability statistics[16]:

1. Flesch reading ease score (rates text on a 100-point percentage scale, with a higher score indicating easier reading);
2. Flesch-Kincaid grade level score (rates text on a US grade-school level 0-12), available in Microsoft Word 2000 software (Microsoft Corp, Redmond, Va). They were 93% and 2.2, respectively, indicating that the questionnaire was appropriate for the population studied. Figure 1 summarizes the development process.

Table 2. Descriptive Statistics for the CPQ_{8-10} Overall and Subscale Scores

	Mean±SD	Range	Floor effect*	Ceiling effect†
Total scale (0-100)‡	18.6±12.6	1-55	0.0	0.0
Subscales				
Oral symptoms (0-20)	5.6±3.2	1-17	8.8	0.0
Functional limitations (0-20)	4.1±3.5	0-15	16.2	0.0
Emotional well-being (0-20)	3.7±3.5	0-13	17.6	0.0
Social well-being (0-40)	5.2±4.7	0-19	8.8	0.0

*Proportion with 0 score.
†Proportion with maximum score.
‡( )=range of possible values.

Table 3. Construct Validity—Rank Correlations Between CPQ_{8-10} Scores and Global Ratings of Oral Health and Overall Well-being (N=68)

	Oral health		Overall well-being	
	R*	P†	R*	P†
Overall scale	0.17	NS	0.45	<.001
Subscales				
Oral symptoms	0.31	0.010	0.45	<.001
Functional limitations	0.03	NS	0.48	<.001
Emotional well-being	0.29	0.017	0.32	.008
Social well-being	0.08	NS	0.25	.038

*Spearman's correlation coefficient.
†*P* value.
NS-Not significant

The CPQ_{8-10} consists of 25 questions organized into 4 health domains:

1. oral symptoms (N=5);
2. functional limitations (N=5);
3. emotional well-being (N=5);
4. social well-being (N=10).

The questions ask about the frequency of events in the previous 4 weeks in relation to the child's oral/orofacial condition. The response options are: "never"=0; "once/twice"=1; "sometimes"=2; "often"=3; and "everyday/almost everyday"=4. The instrument also contains global ratings of the child's oral health and extent to which the oral/orofacial condition affected his/her overall well-being. They are worded as follows: "When you think about your teeth or mouth, would you say that they are…" and "How much do your teeth or mouth bother you in your everyday life?" A 4-point response format, ranging from "very good"=0 to "poor"=3 and from "not at all"=0 to "a lot"=3, respectively, is offered for these ratings.

Pretesting

The questionnaire was assessed for readability, comprehension, and ease of administration in a study that involved a convenience sample from patient populations attending public health dental clinics in the York Region, Ontario. Following self-administration of the questionnaire, a qualitative interview was conducted concerning each child's understanding of instructions, wording of items, recall period, and response options. The "think-aloud"[17] and observational monitoring[18] pretesting techniques were also applied.

Evaluation

The performance of the CPQ_{8-10} was assessed in a validity and reliability study. A new sample of children completed the questionnaire. This provided data for validity and internal consistency reliability testing. A subgroup of these children was invited to complete the questionnaire again after a period of 2 weeks for the purpose of test-retest reliability assessment. In the follow-up questionnaire, global ratings were replaced with global transition ratings (ie, questions that ask if the child's oral health and/or overall well-being has changed since recruitment). This information is required to calculate the test-retest reliability coefficient as the proportion of the score variance attributable to true differences between patients whose health status is stable over time.[11] Baseline and follow-up questionnaires were self-administered. Dental charts provided clinical data for the study participants.

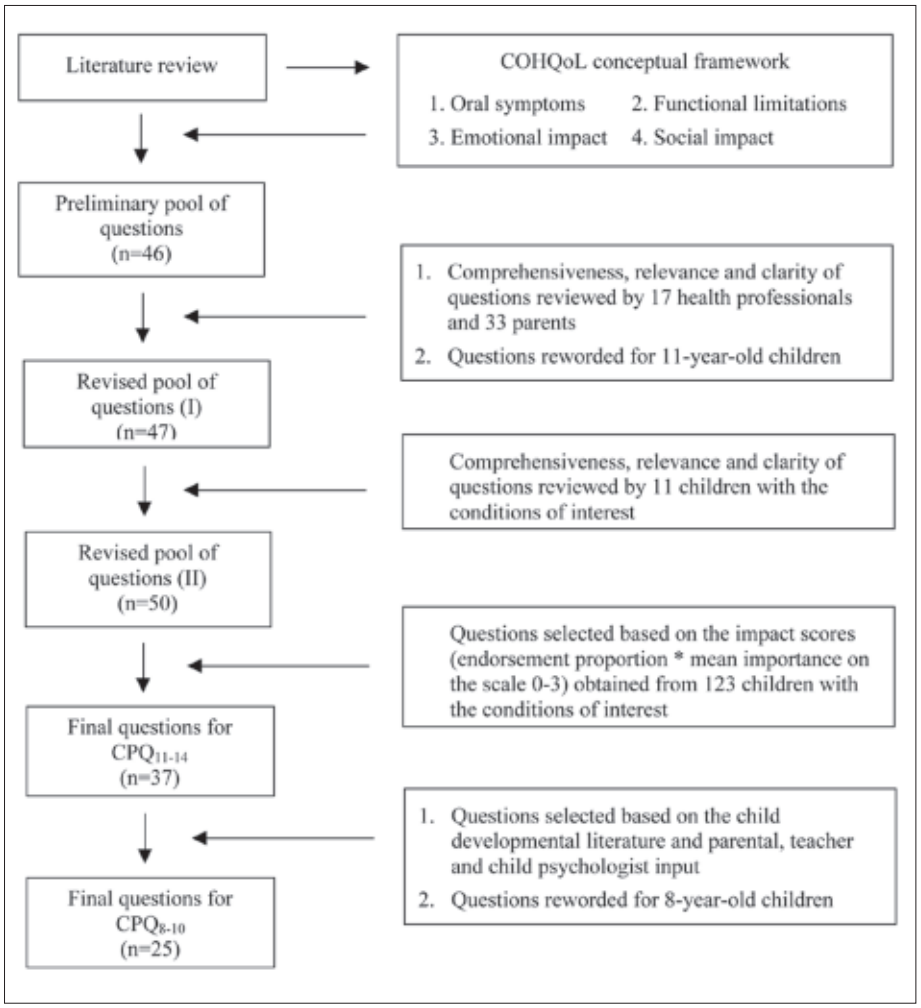

Figure 1. Development of the CPQ_{8-10} questions.

Overall and subscale scores for the CPQ_{8-10} were calculated by adding up the response codes. To test construct validity, the associations between the scores and global ratings were determined. This involved correlation and comparison analyses. In the latter, the differences in scores were assessed according to the global ratings categories. The variation in scores according to the severity of the child's condition was also examined, as this was feasible given the clinical data that were collected. In the pediatric dentistry group, the correlation between the overall score and the number of decayed tooth surfaces (DS) and difference in overall scores between children with and without caries were examined. Testing of construct validity for the orofacial group could not be undertaken because of the small numbers in the diagnostic categories. Since score distributions were asymmetrical, the rank correlation and the Mann-Whitney test were used in analyses performed.

Internal consistency reliability was tested by means of Cronbach's alphas, and test-retest reliability was tested via intraclass correlation coefficients calculated using a one-way analysis of variance random effects parallel model.[19,20]

Results

Participants' characteristics

Thirty-seven children participated in the study to pretest the CPQ_{8-10}. The validity and internal consistency reliability testing involved 68 children, of whom 33 completed the questionnaire twice and provided data for the test-retest reliability assessment. Table 1 presents the characteristics of the validity and reliability study participants in terms of clinical group, gender, and age.

Table 4. Construct Validity—Overall and Subscale CPQ_{8-10} Scores by Global Ratings of Overall Well-being

	Overall well-being affected*				
	Not at all (N=24)		Some/a little bit (N=43)		*P*†
	Median	Mean±SD	Median	Mean±SD	
Total scale	11.5	11.3±6.7	17.0	22.4±13.4	<.001
Subscales					
Oral symptoms	3.0	4.0±2.3	6.0	6.5±3.3	.001
Functional limitations	1.5	2.0±1.9	4.0	5.2±3.7	<.001
Emotional well-being	1.0	1.9±2.1	3.0	4.6±3.7	.002
Social well-being	3.0	3.5±3.2	4.0	6.1±5.2	.031

*Category A lot not included as N=1.
†*P* values obtained from Mann-Whitney test.

Table 5. Construct Validity—Overall and Subscale CPQ_{8-10} Scores by Clinical Group

	Clinical group				
	Pediatric dentistry (N=42)		Orofacial (N=43)		*P**
	Median	Mean±SD	Median	Mean±SD	
Total scale	15.0	18.4±11.5	14.0	19.1±14.4	NS
Subscales					
Oral symptoms	6.0	6.1±3.2	5.0	5.0±3.1	NS
Functional limitations	4.0	3.5±2.7	4.0	5.0±4.5	NS
Emotional well-being	3.0	4.0±3.5	2.0	3.1±3.5	NS
Social well-being	3.5	4.7±4.6	4.0	6.1±4.8	NS

**P* values obtained from Mann-Whitney test.

Table 6. CPQ_{8-10} Reliability Statistics

	No. of items	Cronbach's alpha (N=68)	Intraclass correlation coefficient* (N=33)
Overall scale	25	0.89	0.75
Subscales			
Oral symptoms	5	0.63	0.89
Functional limitations	5	0.68	0.80
Emotional well-being	5	0.78	0.69
Social well-being	10	0.76	0.16

*One-way random effect parallel model.

Pretesting results

While all 9- and 10-year-olds were able to follow the instructions, 10 of 13, 8-year-old children did not relate to the introductory/transition statement: "In the past 4 weeks, because of your teeth or mouth …", when responding to

the questions. This indicated that 8-year-olds require either a simpler format or an interviewer supervised/administered questionnaire. Because the authors intended to develop a self-completing questionnaire, the layout was simplified by making the aforementioned statement part of each question.

Evaluation results

CPQ_{8-10} descriptive statistics—There were no missing data. The overall scores ranged from 1 to 55, with a mean of 18.6 and a standard deviation of 12.6 (Table 2). There were no children with either floor effect (ie, score=0) or ceiling effect (ie, maximum score). The subscale scores also showed substantial variability, with moderate floor and no ceiling effects (Table 2). When the responses "often" or "everyday/almost everyday" are counted for each child, the proportion of those reporting 1 or more symptoms, functional limitations, emotional experiences, and impacts on social well-being was 34%, 24%, 16%, and 25%, respectively.

CPQ_{8-10} construct validity—Almost all hypotheses concerning relationships between the CPQ_{8-10} scores and global ratings were confirmed. In other words, there were positive correlations between the overall scores and the ratings for oral health and overall well-being. Also, as expected, the rank correlation coefficient was higher for the overall well-being rating (r=0.45; P<.001) than the oral health rating (r=0.12; not significant, Table 3). Positive correlations were also observed between all subscale scores and both global ratings, except between the functional limitations and social well-being scores and oral health rating (Table 3). Furthermore, the mean score for children reporting that their well-being was "not at all" affected by their oral or orofacial condition was 2 times smaller than the mean score for those reporting that it was affected "some/a little bit" (11.5 vs 22.4; P<.001, Table 4). All subscales showed the same direction of the differences between these 2 groups of children (Table 4).

The impact level was, on average, higher in the orofacial than in the pediatric dentistry group, as expected. The difference in scores, however, was only 0.7 (19.1 vs 18.6; not significant). While children in the pediatric dentistry group reported more oral symptoms, children in the orofacial group were more likely to experience functional limitations and effects on social well-being (Table 5).

As predicted, within the pediatric dentistry group there was a positive correlation between overall scores and the number of decayed tooth surfaces (r=0.29; P=.05). Moreover, children with decayed teeth had, on average, a higher overall score than caries-free children (21.1 vs 14.7; P=.037). The same direction of differences was observed in all domains, with the mean emotional and social well-being score being 2 times higher in the former than in the latter patient group: 5.2 vs 2.5 (P=.028) and 5.7 vs 3.4 (P=.018), respectively.

CPQ_{11-14} reliability—Cronbach's alpha for the overall scale was 0.89, indicating very high internal consistency reliability (Table 6). The subscales demonstrated moderate to high internal consistency reliability, as the coefficients ranged from 0.63 for oral symptoms to 0.78 for emotional well-being.[11] The overall scale Cronbach's alphas were 0.88 in the pediatric dentistry group and 0.92 in the orofacial group.

Although 39 children participated in the test-retest reliability study, the intraclass correlation coefficient (ICC) was based on data from 33 children. The remaining 6 children were excluded because they reported that their oral health and/or overall well-being had changed between the 2 administrations of the questionnaire. The ICC for the overall scale was 0.75, indicating substantial agreement.[21] The oral symptoms, functional limitations, and emotional well-being subscales showed substantial to almost perfect test-retest reliability, as their ICCs were 0.89, 0.80, and 0.69, respectively. The ICC for the social well-being subscale was low at 0.16 (Table 6). For the pediatric dentistry and orofacial groups, the ICCs were 0.75 and 0.78, respectively.

Discussion

This paper presents the results of a study to develop and evaluate a questionnaire measuring the impact of various oral and orofacial diseases and disorders affecting children ages 8 to 10 years. The CPQ_{8-10} consists of 25 items organized into 4 health domains: (1) oral symptoms; (2) functional limitations; (3) emotional; and (4) social well-being. Therefore, it conforms to the contemporary concepts of child health.

The CPQ_{8-10} development process ensured that it assesses not only experiences related to disease/disorder, but also the extent to which these experiences compromise the individual's quality of life.[22,23] Questions selected from the initial item pool concern problems that children reported as the most frequent as well as the most bothersome. Thus, they combine information about oral health status and the value attached to that status. As such, the CPQ_{8-10} reflects the intent of the WHO definition of health by capturing both health status and well-being.[24]

The questionnaire and its components demonstrated remarkable feasibility in that there were no missing data. Furthermore, the range of overall and subscale scores showed that the CPQ_{8-10} detected substantial variability in children's perceptions of their OHRQoL indicating its substantial measurement sensitivity. The study results suggest that the CPQ_{8-10} has good construct validity. It did not, however, demonstrate discriminative validity. The small difference in the impact on quality of life reported by pediatric dentistry and orofacial patients can be attributed to the high quality of clinical and psychosocial care provided to the latter by The Hospital for Sick Children treatment teams continuously from their birth throughout childhood. The lack of a marked difference is also consistent with the contemporary models of disease/disorder and its consequences. The model by Cleary et al[25] indicates that health outcomes experienced by an individual are not determined only by the nature and severity of the disease/disorder, but also by the personal and environmental characteristics.

The CPQ_{8-10} scale and subscales showed substantial internal consistency reliability. Test-retest reliability was also acceptable, except for the social well-being subscale. Although a 2-week interval was intended for a post-test administration, it ranged between 13 and 38 days, with almost 50% of children completing the questionnaire at or after 20 days. As the questionnaire recall time is 4 weeks, this meant that these children were referring to a different time period when responding to the questions at pretest and posttest. Social functioning and experiences are more likely to show variability over time than the physical and emotional effects of oral and orofacial conditions. Consequently, this may have accounted for the low ICC. A Cronbach's alpha of 0.80 for the social well-being subscale at posttest supports this explanation. Regardless, further testing of the test-retest reliability of this component of the CPQ_{8-10} is required.

The biomedical paradigm is making way for one in which subjective experiences are given more weight. Consequently, it is becoming important that clinical indicators are supplemented with patient-based health outcome measures when:

1. assessing the oral health of individuals and populations;
2. making clinical decisions;
3. evaluating dental interventions, services, and programs.

It is significant to gain insight into the effects of oral conditions on children's daily lives, as they may not only limit children's current functioning, but also compromise their future development and achievements.

By providing a comprehensive assessment of oral health-related quality of life, the CPQ_{8-10} offers a broader perspective on oral diseases and disorders in 8- to 10-year-olds. Thus, the information the CPQ_{8-10} supplies has the potential to help determine treatment needs, select therapies, monitor treatment progress, and assess the outcomes of therapies for these children in context of research, clinical practice, or policy formulation.

Conclusions

1. This study's results provide evidence about good feasibility, measurement sensitivity, construct validity, and test-retest reliability (ie, discriminative properties of the CPQ_{8-10}).
2. These are preliminary findings based on convenience sampling, and the discriminative properties of the CPQ_{8-10} need to be tested in replicated studies involving clinical and general child populations in various settings.
3. For the CPQ_{8-10} to be used as an outcome measure in intervention studies, it is necessary to determine its evaluative properties: (1) longitudinal construct validity; (2) responsiveness; and (3) minimal clinically important difference.

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Abstract of the Scientific Literature

Assessing the Impact of Oral Health on the Life Quality of Children

Dental caries remains one of the most prevalent diseases of childhood, despite efforts to improve prevention and treatment. While the measurement of oral disease and conditions as they exist in children is clinically important, this paper suggests that these parameters should not be used to indicate the overall oral health of children. Oral health has been described as the standard of health of the oral and related tissues that contribute to the general well-being of an individual. Equating treatment needs with oral health may be an oversimplification of the concept. Currently, there are very few techniques designed to comprehensively assess the physical, social, and psychological effects of oral health and oral health-related quality-of-life issues. This paper outlines the value of and need for assessing child oral health-related quality of life (COHQoL) with various instruments. This may be important, since quality-of-life assessments can reflect children's feelings about their oral health and can be used to improve communication between patients, parents, and dental care providers. These assessments can also be used to plan oral health policy and care prioritization. Finally, COHQoL assessments can be used to develop guidelines for evidence-based practice. The development of useful assessment tools will be complicated and challenging, but a number of international studies have begun developing such measures. As the field of COHQoL expands, several measures will be available for use. It will be important, however, to evaluate the instruments and make sure they are appropriate to serve their purposes.

Comment: This paper proposes interesting insight into oral health assessments. It may be advantageous to consider the "whole child" when developing policies and evidence-based care programs. **BB**

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