Is the Child Oral Health Quality of Life Questionnaire Sensitive to Change in the Context of Orthodontic Treatment? A Brief Communication

Shoroog Agou, BDS; Monika Malhotra, D.DS, MSc, FRCD; Bryan Tompson, D.DS, D. ORTHO, D. PAEDO, FRCD(C), FACD; Preeti Prakash, D.DS; David Locker, DDS, PhD, DSc, FCAHS

Abstract

Objective: *This study aimed to assess the ability of the Child Oral Health Quality of Life Questionnaire (COHQoL) to detect change following provision of orthodontic treatment.* ***Methods:*** *Children were recruited from an orthodontic clinic just prior to starting orthodontic treatment. They completed a copy of the Child Perception Questionnaire, while their parents completed a copy of the Parents Perception Questionnaire and the Family Impact Scale. Normative outcomes were assessed using the Dental Aesthetic Index (DAI) and the Peer Assessment Rating (PAR) index. Change scores and effect sizes were calculated for all scales.* ***Results:*** *Complete data were collected for 45 children and 26 parents. The mean age was 12.6 years (standard deviation = 1.4). There were significant pre-/posttreatment changes in DAI and PAR scores and significant changes in scores on all three questionnaires ($P < 0.05$). Effect sizes for the latter were moderate. Global transition judgments also confirmed pre-/posttreatment improvements in oral health and well-being.* ***Conclusion:*** *The results provide preliminary evidence of the sensitivity to change of the COHQoL questionnaires when used with children receiving orthodontic treatment. However, the study needs to be repeated in different treatment settings and with a larger sample size in order to confirm the utility of the measure.*

Key Words: children, malocclusion, oral-related quality of life, validity, responsiveness

Introduction

The process of developing and evaluating oral health-related quality of life measures involves an ongoing assessment of the performance of the measure in different populations and various contexts. This is particularly important with respect to generic measures which were developed to be used as outcome indicators in surveys and clinical trials. The Child Oral Health Quality of Life Questionnaire (COHQoL) is a generic instrument designed to assess the adverse impacts of oral conditions on children aged 11-14 years (1-3). It consists of questionnaires for children [Child Perception Questionnaire (CPQ11-14)] and parents [Parents Perception Questionnaire (PPQ)], and a Family Impact Scale (FIS) also completed by parents. The cross-sectional construct validity and test–retest reliability of the questionnaires have been established (4). The sensitivity of the CPQ11-14 to variations in orthodontic status has also been demonstrated (5). However, a key property of any measure used to evaluate a therapeutic intervention is sensitivity to change. To date, no studies have assessed the utility of the COHQoL as an evaluative measure.

Consequently, we undertook a study of 11- to 14-year-old children with malocclusions who received orthodontic therapy to determine if the CPQ11-14, PPQ, and FIS were able to detect pre-/posttreatment changes in the oral health quality of life of these children. In assessing sensitivity to change, there are three issues that need to be considered, namely responsiveness, longitudinal construct validity, and the minimal important difference (4,5).

Methods

Study Design. This study utilized a single group before-and-after design to assess changes in oral health-related quality of life following orthodontic treatment.

Study Subjects. Participants were 11- to 14-year-old children with clinically identified malocclusions as defined by the Dental Aesthetic Index (DAI) (6) and the Peer Assessment Rating (PAR) (7). The children were consecutively recruited during their first orthodontic screening visit at the Faculty of Dentistry, University of Toronto. To be eligible, a child had to be fluent in English and be in good general health. Children with severe dento-facial deformities were excluded. Parents' consent and children's assent were obtained, and the University Research Ethics Board approved all study procedures. Comprehensive orthodontic treatment of an average duration of 28 months was provided to all subjects. Follow-up data were collected at the first recall appointment after treatment was completed. If the parent/caregiver failed to attend the recall appointment, the questionnaire was mailed to their home address with a self-addressed envelope. A second copy was mailed if the follow-up questionnaire had not been returned within 1 month.

Send correspondence and reprint requests to Shoroog Agou, Faculty of Dentistry, University of Toronto, 124 Edward Street, Toronto, ON, Canada M5G 1G6. Tel.: 416-979-4912 extension 2; Fax: 416-979-4936; e-mail: shoroog.agou@utoronto.ca. Shoroog Agou, Monika Malhotra, Bryan Tompson, Preeti Prakash, and David Locker are with the Faculty of Dentistry, University of Toronto, Toronto, ON, Canada. Manuscript received: 1/3/08; accepted for publication: 2/2/08.

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Data Collection. Data were obtained using the CPQ11-14 (1), PPQ (2), and FIS (2). The following subscale scores were created for the CPQ11-14 and PPQ by summing the responses to items organized into conceptually distinct subscales: oral symptoms (OSs), functional limitations (FLs), emotional well-being (EWB), and social well-being (SWB). Included in the follow-up CPQ11-14 and PPQ questionnaires were single-item global transition ratings pertaining to change in subjects' perception of dental appearance and occlusion, oral health, and overall well-being as a result of orthodontic treatment. These were scored on a 7-point scale ranging from "improved a lot" to "worsened a lot."

Pre- and posttreatment study models were taken to assess the child's occlusion using the DAI and PAR. The ratings were undertaken by three calibrated examiners. Intra-examiner reliability for the DAI raters was high with intraclass correlation coefficients (ICCs) of 0.98, 0.91, and 0.98, respectively. The ICC for inter-examiner reliability was 0.80. For the PAR raters, ICCs for intra-examiner reliability were all 0.99 and for inter-examiner reliability the ICC was 0.95.

Data Analysis. Change scores for the overall CPQ11-14, PPQ, and FIS were computed by subtracting post-treatment scores from pretreatment scores. Paired *t*-tests were used to test the statistical significance of the changes. Change scores were also calculated for the DAI and PAR and evaluated using paired *t*-tests. The *P* value for all tests was set at $P < 0.05$. The responsiveness of the questionnaire and clinical measures was determined by the calculation of effect sizes. Effect size (*d*) statistics were calculated by dividing the mean of the change scores by the standard deviation (SD) of the pretreatment scores, in order to give a dimensionless measure of the effect. Effect size statistics of <0.2 indicate a small clinically meaningful magnitude of change, 0.2-0.7 a moderate change, and >0.7 a large change (8). Assessment of longitudinal construct validity and calculation of the minimal important differences were limited by a lack of variation in responses to the global transition ratings.

Results

Sample Characteristics. Complete baseline and follow-up data were available for 45 children and 26 parents. The mean age of those children was 12.6 years (SD = 1.4) and almost 60 percent were girls.

The mean DAI and PAR scores at baseline and follow-up are presented in Table 1. As expected, significant declines were observed with effect sizes exceeding 2.0 ($P < 0.001$). Data on the pre-orthodontic intervention and post-orthodontic intervention COHQoL scores with effect sizes are also presented in Table 1. With the exception of the FL and SWB subscales of the PPQ, all scales and subscales demonstrated significant reductions following orthodontic treatment ($P < 0.05$). This reduction was associated with effect sizes reflecting moderate changes. By subscale, the largest change score was observed for the EWB subscale of the CPQ11-14, and the OS subscale of the P-CPQ.

Table 2 shows the distribution of responses to the global transition items for children and parents. For all items, the majority reported that they improved a lot or improved somewhat. Longitudinal construct validity is indicated if those reporting improvement on the global transition ratings have positive change scores, those reporting deterioration have negative change scores, and those who report no change have scores close to zero. The skewed distribution and small cell sizes precluded such assessment. Similarly, the method recommended by Juniper et al. (9) for calculating minimal important differences could not be employed. However, those children who reported that their overall well-being had improved somewhat had mean CPQ change scores of 6.6, and those who reported improving a little had mean change scores of 5.0. Although based on small numbers of subjects, these provide a preliminary estimate of the minimal important difference for the CPQ11-14.

Table 1
Comparison of the Child Oral Health Quality of Life Questionnaire (COHQoL) Overall, Domain Scores, and Clinical Measures Before and After Orthodontic Treatment

	COHQoL scores: pre-/posttreatment			
	Pretreatment	Posttreatment	*P* value*	Effect size
CPQ11-14	60.7	50.8	<0.001	0.55
Oral symptoms	12.0	10.3	<0.01	0.50
Functional limitation	14.8	13.1	<0.05	0.45
Emotional well-being	15.0	11.4	<0.001	0.60
Social well-being	18.9	16.0	<0.01	0.44
PPQ	53.8	46.3	<0.05	0.39
Oral symptoms	12.2	9.9	<0.01	0.56
Functional limitation	11.5	11.7	NS	–
Emotional well-being	14.2	10.3	<0.01	0.51
Social well-being	15.9	14.5	NS	0.20
Family Impact Scale	20.7	17.6	<0.01	0.42
Clinical measures: pre-/posttreatment				
DAI	36.6	18.2	<0.001	2.1
PAR	30.4	4.2	<0.001	2.2

* Paired *t*-test.
Sample sizes: child $n = 45$; parents $n = 26$.
Effect sizes: pretreatment score–posttreatment score/standard deviation of baseline score.
CPQ11-14, Child Perception Questionnaire; PPQ, Parents Perception Questionnaire; DAI, Dental Aesthetic Index; PAR, Peer Assessment Rating; NS, not significant.

Table 2
Distribution of Children and Parents' Responses (%) to Global Questions About the Extent to Which Appearance, Occlusion, Oral Health, and Life Overall Were Affected by Orthodontic Treatment

	Appearance		Occlusion		Oral health		Life effect	
Global transition ratings	Child	Parent	Child	Parent	Child	Parent	Child	Parent
Improved a lot	86.7	97.2	86.7	88.9	48.9	72.2	44.4	61.1
Improved somewhat	5.6	0	11.1	11.1	33.3	16.7	35.6	19.4
Improved a little	2.8	2.8	0	0	6.7	2.8	11.1	11.1
Stayed the same	0	0	2.2	0	11.1	5.6	8.9	8.3
Worsened a little	0	0	0	0	0	2.8	0	0
Worsened somewhat	0	0	0	0	0	0	0	0
Worsened a lot	0	0	0	0	0	0	0	0

Discussion

This study aimed to document changes in the oral health-related quality of life of children having orthodontic treatment, and, in doing so, to examine the evaluative properties of the COHQoL questionnaires. The provision of orthodontic treatment was associated with substantial and statistically significant improvements in scores on the CPQ11-14, PPQ, and FIS (Table 1). Hence, the COHQoL was found to be sensitive to change in the context of orthodontic treatment for children with malocclusion.

Responsiveness and longitudinal construct validity are important characteristics of oral health-related quality of life instruments which are to be used as evaluative measures. Effect sizes were used in this study to compare the relative responsiveness to change resulting from orthodontic interventions using both subjective and clinical measures. The data in Table 1 provide evidence that responsiveness was acceptable for all three scales of the COHQoL with moderate effect sizes observed. These effect sizes were comparable to those reported for other widely used instruments such as the OHIP-14 (10). The changes in COHQoL scores were paralleled by substantial decreases in the scores on the two normative indices employed. Some minor concerns remain because of the clustered distribution of responses to the global transition ratings, shown in Table 2. This precluded assessment of longitudinal construct validity and the proper calculation of the minimal important difference. However, the fact that the majority of children reported considerable improvement as a result of treatment supports the validity of the measure as an indicator of change.

Ideally, this study should have included a comparison group which did not receive treatment. This would have allowed comparison of changes in scores over time between a treated group and one who had not received treatment. However, our objective was not to evaluate the benefit to be derived from orthodontic treatment; rather, it was to assess the sensitivity to change of a measure. A study is underway to compare change scores of a treated and an untreated group of children with malocclusions which can address the issue of treatment efficacy. Its larger sample size will also allow the sensitivity to change of the COHQoL to be explored more fully. Nevertheless, the results reported here suggest that the COHQoL is a suitable measure to use when the aim is to assess changes in child oral health-related quality of life. The effect sizes we report and the preliminary estimate of the minimal important difference can also provide the basis for sample size calculations for treatment efficacy studies.

The children in this study are among those with the worst malocclusions in their age group. This means that the sensitivity of the instruments to more subtle differences and changes in child oral health requires further investigation. Future work with the COHQoL measures should determine whether there are differences in quality of life outcomes associated with different orthodontic intervention strategies such as multiple extractions versus functional appliance therapy.

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