

Research Article

Validity of Lithuanian Version of the Child Perceptions Questionnaire Among Adolescents up to the Ages of 18

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Abstract

Background: The Child Perceptions Questionnaire (CPQ) is the most commonly used measure of Oral Health-Related Quality of Life (OHRQoL) and its validity and reliability have been tested among children/adolescents aged 11 to 14 years in many languages and populations. This innovative study was aimed to validate the CPQ among adolescents aged 15 to 18 in the population survey of orthodontic anomalies in Lithuania.

Methods: Representative samples of adolescents aged 11–14 years ($N=307$), 15–16 years ($N=721$) and 17–18 years ($N=563$) were selected from public schools of Lithuania. The CPQ including four domains, namely oral symptoms (OS), functional limitations (FL), emotional well-being (EWB), and social well-being (SWB), was used to measure OHRQoL. A self-reported malocclusion and orthodontic examinations were used to assess malocclusion.

Results: The distributions of individual items and sum scores of the CPQ and its domains did not differ significantly between 11–14, 15–16 and 17–18 age groups of adolescents. Across all age groups, Cronbach's alpha for the total CPQ was approximately equal to 0.90 indicating good internal consistency reliability; the total CPQ and all domains significantly correlated with oral health, oral well-being and global life satisfaction. Discriminant validity analysis revealed that adolescents with severe malocclusion suffered a greater impact on their emotional and social well-being than those without malocclusion, however, this relationship was more engaging in group of adolescents aged 15–18 than in 11–14-year-olds. A moderate agreement between child and parental reports was found for OS and FL domains.

Conclusions: The Lithuanian version of the CPQ for measuring OHRQoL among adolescents aged 15 to 18 years seems to be as valid and reliable as for adolescents aged 11 to 14 years.

Keywords: Oral health-related quality of life, Child Perceptions Questionnaire, validity, reliability, orthodontics, adolescents, Lithuania

Introduction

Oral health-related quality of life (OHRQoL) is a holistic concept which determines the subjective functional and psycho-social impacts of oral disease on overall well-being.[1–3] Measuring OHRQoL provides essential information when making clinical decisions for individuals and helping public health actions and policies to uncover the needs of the society in prevention and treatment of oral disorders.[3–5] Hence, OHRQoL has been widely studied over the past two decades and many tools have been developed, but mostly for adults.[6, 7]

Recently, increasing attention has been also paid to OHRQoL in children and adolescents. The OHRQoL instruments designed to assess the impact of oral conditions on the daily lives of children and adolescents have been developed ranging from measurement of patient-reported oral functional and psychosocial problems to subjective well-being relating to oral health. Systematic reviews [8, 9] identified at least three validated instruments to measure OHRQoL in children and adolescents: Child Oral Impact of Daily

Performances index,[10] Child Oral Health Impact Profile,[11] and Child Perceptions Questionnaire.[12]

The most commonly used OHRQoL questionnaire is the *Child Perceptions Questionnaire* (CPQ). It was developed by Jokovic *et al.* [12] as the CPQ_{11–14} for children aged from 11 to 14 and was originally validated in children with caries, malocclusion and craniofacial anomalies.[12] In terms of cognitive development, age specific versions of this tool have been produced.[13] The CPQ does also have an analogous Parental CPQ which can be used as a proxy to Child CPQ.[14] The original item pool of the CPQ consists of 37 items, but the authors have also determined the psychometric properties of its shortened forms.[15] All variations of the CPQ evaluate the frequency of oral and orofacial impacts on children OHRQoL at symptomatic, functional, emotional and social levels whereas other questionnaires focus on severity of oral impacts. To date, the CPQ has been translated, validated and adapted to suit a number of languages and socio-cultural contexts demonstrating its applicability and perfect psychometric properties on numerous clinical and epidemiological occasions.[16–22]

OHRQoL research among children and adolescent in Lithuania is still nascent and no measures have been validated to date. Given the positive CPQ properties and its high applicability for both clinical assessments and large-scale population studies we have chosen this instrument for measure of OHRQoL in our research. It was also considered that the original long form (37 items) of this instrument is more sensitive to changes in oral conditions rather than its short forms,[15] hence, the original questionnaire was taken in focus. As it is well known that every time as the measurement scale is used in a new context or with a different population group, it is necessary to test its psychometric properties.[23] Therefore, our recent study, like most other similar studies, has been focused on adaptation and validation of the CPQ₁₁₋₁₄ in Lithuanian adolescents aged 11–14 years. A detailed examination of psychometric characteristics including factorial analysis of the Lithuanian version of CPQ with a modified item of the oral pain showed that the instrument is valid to be used in further studies for measuring OHRQoL among 11–14-year-old adolescents in Lithuania (Kavaliauskienė A, Šidlauskas A, Zaborskis A., 2018. Manuscript under review).

This study is a part of a large research project aimed to examine extend of orthodontic anomalies and OHRQoL among children and adolescents aged from 11 to 18 years in Lithuania. Hence, there was a problem to choose an appropriate instrument to measure OHRQoL among adolescents up to the ages of 18. We hypothesized that the association between severity of oral disorders and OHRQoL in older adolescent samples (e.g. in 15–16- or 17–18-year-olds) is possibly more evident than in sample of adolescent aged 11–14 years. Therefore, the CPQ instrument to measure OHRQoL among older adolescents could be as much valid as it was valid for adolescents aged 11–14 years. Only a few relevant studies were conducted among adolescents over the age of 14 but none in population older than 16 years of age [24–27].

As a consequence, the aim of the present study was to validate the CPQ among adolescents aged from 15 to 18 in the population survey of orthodontic anomalies in Lithuania.

Methods and Material

The study followed a cross-sectional design and was a part of a larger research project aimed to examine OHRQoL among children and adolescents in Lithuania. It was conformed to the principles outlined in the Declaration of Helsinki. Ethical approval for the study was granted by the Kaunas Regional Biomedical Research Ethics Committee (reference number BE-2–27) and was in line with local practice for school survey distribution. Written informed consent for child’s participation in the study was sought from both parents prior to his/her participation in the research.

Target population was adolescents aged 11–18 years. The sample being studied was made up of students from 26 randomly selected public schools using random cluster (school, class) sampling and included approximately 2000 students. School authorities were contacted by researchers and informed about all aspects of the study. Parents were then asked to provide permission for their child to participate in the study.

Data was collected using both questionnaires and dental examinations. The self-completed questionnaires for students were

administrated in school classrooms before dental examination by the classroom teaching staff to ensure a familiar and consistent environment. Confidentiality and anonymity of respondents was ensured. A total of 1591 students (80% of initial sample and 94% of those who had parents’ permission) presented correctly completed questionnaires. Those parents who gave consents were also asked to complete a self-report questionnaire about child’s oral health and well-being. The number of correctly completed parents’ questionnaires was 1365 (67% of invited parents).

The orthodontic examination was a part of the dental examination. It was carried out in randomly selected 20 of 26 schools. Students’ examination was performed according to the methodology of oral status evaluation recommended by the WHO under standardized conditions in the school’s medical offices using portable equipment for dental examination [28]. The orthodontic examination of all students was undertaken by one orthodontist (A.K.) who was trained and tested in reliability of accessing orthodontic status (U.K. Cardiff University School of Dentistry, 2012) and her assistant.

In the end, 911 students participated both in the questionnaire and dental surveys, and 1365 parents provided their completed questionnaires to students who participated in the questionnaire survey. The size of studied sample was adequate to the minimum calculated as necessary (N=969). Figure 1 presents flow diagram of data collection and also illustrates the sample structure by age of adolescents.

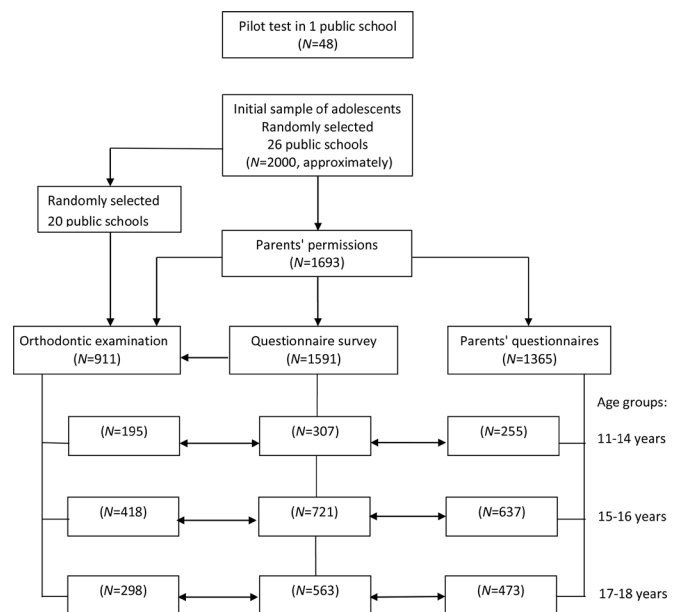


Figure 1. Flow-diagram of the data collection process and distribution of participants in three age groups.

Before the main study, a pilot test was carried out with a sample (N=48) of students in one school. It confirmed the feasibility of the methodology with only minor modification of questionnaire wording and confirmed the organization of data collection procedures.

The originally created self-reported questionnaires for students and parents consisted of items assessing oral health and OHRQoL as well as demographic and social aspects of adolescent health.

The Lithuanian version of the CPQ₁₁₋₁₄, cross-culturally adapted and validated for Lithuanian adolescents aged 11–14 years (Kavaliauskienė A, Šidlauskas A, Zaborskis A., 2018. Manuscript under review), was employed to evaluate the impact of oral conditions on the quality of life of adolescents of all ages. This questionnaire, as originally proposed by Jokovic et al.,[12] was a 37-item scale consisting of four health domains (subscales), namely oral symptoms (OS, 6 items), functional limitations (FL, 9 items), emotional well-being (EWB, 9 items), and social well-being (SWB, 13 items). The items of the OS and FL domains were also included into the parents' questionnaire in order to test their agreement with their child's report on his oral health troubles (the domains EWB and SWB were not included into the parents' questionnaire as parents may not know so well the feelings of their children). The items are scored on a 5-point Likert scale ranging from 0 ("never") to 4 ("every day or almost every day"). In the analysis, the scores for each item were added together to obtain a sum scores of each sub-scale as well as the total CPQ scale. Then, the sum scores were standardized to a percentage score scale of 0 – 100% by dividing the sum score by the maximum score and multiplying by 100. Note that higher sum/percentage scores refer to worse OHRQoL.

The students were also asked to rate their oral health and the extent to which it affected their well-being. For each of these dimensions five sub-items were worded in the following way: "How would you describe health status of the following oral parts: - teeth; - lips; - gum; - oral mucosa; - jaws or joints?" and "Over the last three months, how much your overall life was affected by the conditions of the following oral parts: - teeth; - lips; - gum; - oral mucosa; - jaws or joints?" The responses were scored in the following way: with regard to an oral health rating: 0=excellent, 1=very good, 2=good, 3=fair and 4=poor; with regard to well-being: 0=not at all, 1=very little, 2=somewhat, 3=a lot and 4=very much. The final score computed the maximal score on all the sub-items of each dimension.

The global life satisfaction, or well-being, of adolescents was rated using the measurement technique from the Health Behaviour in School-aged Children (HBSC) study [28]. Children were asked to take a look at the drawn ladder, with steps numbered from zero ("0") at the bottom to ten ("10") at the top, with the instruction to suppose the top of the ladder represented the best possible life, and the bottom of the ladder represented the worst possible life. Then they were asked to indicate the step of the ladder at which they would place their lives at present. Thus, the response was scored from 0 to 10.

In the questionnaires, the respondents were asked to rate their malocclusion experience by answering to the question, whether they had ever noticed that their teeth were irregularly grew/situated or they had malocclusion. The answer categories were: 1=yes, I noticed just myself; 2=yes, this was confirmed by dentist; 3- no, I don't have such disorders. In analyses, the first two categories were combined, thus, two sub-groups of respondents, correspondingly 'not healthy' and 'healthy', were selected.

During the orthodontic examination, the *Index of Orthodontic Treatment Need (IOTN)* and the *Index of Complexity, Outcome and Need (ICON)* were recorded according to the methodology by

Richmond (2008).[30] The IOTN measure categorizes the severity of malocclusion based on the relative effect of the various deviant occlusal traits on the longevity of the dentition. The five grades were outlined. Grade 1 recorded small deviations from normal and was categorized as 'no need of orthodontic treatment'. The deviant occlusal anomalies become more severe in Grades 2, 3 and 4, while grade 5 represented the most severe malocclusion (e.g., impacted teeth, large overjet greater than 9 mm, defects of cleft lip and palate) and was categorized as 'very great need of orthodontic treatment'. Grade 4 and 5 were regarded as clinical need for treatment. The another indicator of malocclusion, ICON, is based on five components, which are incorporated into calculation of the ICON value by a following regression equation: $ICON = (Aesthetic\ assessment \times 7) + (Upper\ arch\ crowding/Upper\ spacing \times 5) + (Crossbite \times 5) + (Incisor\ open\ bite/Incisor\ overbite \times 4) + (Buccal\ segment\ antero-posterior \times 3)$. An ICON value of > 43 corresponds to severe malocclusion with a fundamental treatment need [30].

The statistical analysis was performed using the Complex Samples module of the SPSS statistical package (version 21; IBM SPSS Inc., Chicago, IL, 2012) which adjust for the complex cluster-stratified sampling method (schools, classes).[31] All reported *p* values were from two-sided statistical tests and *p* values ≤ 0.05 were considered statistically significant.

Missing data of the CPQ items was replaced with the personal mean if a health domain had not more than half blank items, otherwise the record was excluded from analysis. The distributions of the sum score of the CPQ and its domains were examined and found not to be normally distributed. Therefore, median and Interquartile Range (IQR) were used to describe these distributions and to test the null hypothesis that there is no difference in the CPQ scores between the malocclusion and non-malocclusion groups. Due to the same reasons, binary associations between variables were evaluated with non-parametric Spearman correlation coefficient.

A set of test was used for examination of psychometric properties of the CPQ.[32–34] The Cronbach's alpha was used as measure of internal consistency reliability of the total instrument and its domains. Their values ≥ 0.70 were considered acceptable.[33, 34] Furthermore, other tests of internal reliability (inter-item and item-total correlations) were also investigated. Construct validity of the instrument was tested using Spearman correlation coefficient to assess the association between the scores of total scale as well as its domains and the respondents' rating of their oral health, oral health related well-being, and global life satisfaction. Discriminant validity was tested by comparing the medians of scores between groups defined by malocclusion traits.

Test-retest reliability test of the instrument was not employed. Instead of this, we assessed agreement between children's and their parents' answers to the same questions of the OS and FL domains. The association between child and parental sum scores was assessed by Spearman correlation coefficient, and agreement between two groups of raters was evaluated by the Intra-class Correlation Coefficient (ICC) using two way mixed consistency method and the quadratic weighted kappa.[34] The quadratic weighted kappa was used due to high range of sum scores.

Results

In this study, the sample consisted of 1591 adolescents recruited in the questionnaire survey, among which 911 adolescents were examined by an orthodontist. Participants were divided into three groups by age: 11–14 years ($N=307$), 15–16 years ($N=721$) and 17–18 years ($N=563$) (see Figure 1). In this paper, we looked into the validity of the CPQ scale among adolescents 15–16- and 17–18-year-old, so these groups were more numerous than the reference group of 11–14-year-olds. A total of 927 (58.3%) individuals in the sample were female. The respondents represented both the urban area (68.5%) and rural area (31.5%).

The response rate to the items of the CPQ varied by domains and age groups from 97.1% to 100% with the highest rate (2.9%) of blanks in responses to the items of the SWB domain among 11–14-year-old adolescents. All unanswered questions were restored according to the accepted rules of methods.

The impacts, that is the items scored from 1 ('1 or 2 times') to 4 ('every day or almost every day'), were reported most frequently in

the OS domain ("Pain in teeth, lips, jaws or mouth" – 68.8%; "Food stuck in or between teeth" – 62.0%; "Bleeding gums" – 53.6%; "Bad breath" – 45.2%) and in the EWB domain ("Worried that he/she is not as good looking as others" – 38.3%; "Worried that he/she is not as healthy as others" – 28.8%). Comparing three age groups, there were insignificant differences in prevalence of answers to separate items.

Descriptive statistics of the total CPQ and its domains are presented in Table 1. Sum scores were found to be highly skewed and not to be normally distributed in all the health domains with a very noticeable floor effect, especially in the SWB domain. Out of the theoretical range of 0–100% of relative scores, their mean (except OS domain) and median did not exceed 20%. The distributions of individual items and sum scores of the CPQ and its domains did not differ significantly between adolescents of different age groups. In all age groups, the female adolescents than the male tended to report higher scores of the CPQ (poorer OHRQoL). The significant gender difference was observed for the EWB domain (in all age groups) and for the FL domain (in 17–18-year-olds) (data not presented).

Table 1. Summary statistics of the Child Perceptions Questionnaire and its domains, by age groups

Age group	CPQ Domain	Relative scores					<i>p</i>
		Mean	(95% CI)	Skewness	Median	(IQR)	
11–14 ($N=307$)	CPQ	9.7	(8.6–10.9)	1.78	6.3	(2.7–13.5)	0.509
	Domain OS	20.9	(19.0–22.7)	1.23	16.7	(11.1–27.8)	0.206
	Domain FL	7.7	(6.4–9.1)	2.10	3.7	(0–11.1)	0.895
	Domain EWB	12.6	(10.4–14.7)	2.66	7.4	(0–18.5)	0.129
	Domain SWB	4.0	(2.9–5.1)	4.54	0	(0–2.6)	0.330
15–16 ($N=721$)	CPQ	9.1	(8.5–9.8)	1.86	6.3	(2.7–12.6)	
	Domain OS	21.6	(20.4–22.8)	1.02	16.7	(11.1–33.3)	
	Domain FL	7.1	(6.3–7.9)	2.32	3.7	(0–11.1)	
	Domain EWB	11.2	(9.9–12.5)	2.52	3.7	(0–14.8)	
	Domain SWB	3.3	(2.7–3.9)	4.74	0	(0–2.6)	
17–18 ($N=563$)	CPQ	9.3	(8.5–10.1)	2.04	6.3	(2.7–12.6)	
	Domain OS	23.1	(21.7–24.6)	0.81	22.2	(11.1–33.3)	
	Domain FL	6.9	(5.8–7.6)	2.64	3.7	(0–7.4)	
	Domain EWB	11.9	(10.4–13.4)	2.18	3.7	(0–14.8)	
	Domain SWB	2.9	(2.3–3.5)	4.21	0	(0–2.56)	

CPQ: Child Perceptions Questionnaire, OS: Oral Symptoms, FL: Functional Limitations, EWB: Emotional Well-Being, SWB: Social Well-Being, CI: Confidence Interval, IQR: Range from 1th to 3rd quartile, *p*: test to compare medians across age groups.

Assessments of internal consistency reliability of the CPQ and individual domains are displayed in Table 2. Cronbach's alpha for the total CPQ was approximately equal to 0.90 in all three age groups indicating good internal consistency reliability. Despite the adolescent age, the lowest values of Cronbach's alpha were observed in the OS and FL domains being acceptable value of internal consistency reliability. For the domains EWB and SWB, the coefficient ranged from 0.82 to 0.88, indicating good internal consistency reliability in all three age groups. There was a large range of inter-item correlation and inter-total correlation in all domains, but no noticeable difference in these figures was seen comparing age groups of respondents.

Table 3 displays the correlation between the CPQ sum scores and overall ratings of oral health and well-being, as well as with global life satisfaction indicating construct validity of the instrument. Across all age groups, total CPQ and all domains were found to be significantly ($p<0.01$) and positively correlated with oral health and oral well-being. The correlations between the global life satisfaction and the domains were significant too (a negative correlation value indicates that higher life satisfaction is related to lower rating of oral problems).

Discriminant validity of the instrument was tested assessing CPQ scores in regard to the orthodontic treatment need (Table 4).

Malocclusion traits were recorded in the orthodontic examination and were self-reported in the questionnaire survey. According to the ICON>43 criterion, the need for orthodontic treatment was established in 31.6%, 28.0% and 26.1% ($p>0.05$) of adolescents aged 11–14, 15–16 and 17–18 years respectively, and, according to the IOTN>3 criterion, the need for orthodontic treatment was established in 29.2%, 33.0% and 36.6% ($p=0.049$) of adolescents by corresponding age groups. Subjectively orthodontic anomalies (but not necessarily to be treated) were reported by 55.6%, 56.8% and 57.7% ($p>0.05$) of adolescents in corresponding age groups. Across age groups, there was seen a variation in the gradient of overall CPQ and domain sum scores by malocclusion traits. Adolescents with severe malocclusion (ICON>43 or IOTN>3) suffered a greater impact on their emotional and social well-being than those without malocclusion, however, this relationship was more engaging in groups of adolescents aged 15–16 years and 17–18 years than in 11–14-year-olds. Adolescents who subjectively reported malocclusion in comparison with their ‘healthy’ counterparts indicated significantly greater scores for all domains in the 15–16 age group and for the OS, EWB and SWB domains in the 17–18 age group, while only for the single EWB domain in 11–14 age group.

Table 2. Internal consistency of the Child Perceptions Questionnaire and its domains, by age groups

Age group	CPQ/Domain	IIR range	ITR range	Cronbach's alpha
11–14 (N=307)	CPQ	-0.04–0.83	0.17–0.59	0.90
	Domain OS	0.01–0.50	0.22–0.55	0.66
	Domain FL	0.05–0.56	0.30–0.47	0.72
	Domain EWB	0.01–0.76	0.18–0.67	0.82
	Domain SWB	-0.01–0.83	0.34–0.63	0.87
15–16 (N=721)	CPQ	-0.05–0.78	0.14–0.70	0.90
	Domain OS	0.16–0.73	0.32–0.69	0.73
	Domain FL	0.00–0.57	0.12–0.56	0.71
	Domain EWB	0.17–0.73	0.40–0.80	0.88
	Domain SWB	0.02–0.78	0.29–0.71	0.86
17–18 (N=563)	CPQ	0.01–0.76	0.20–0.63	0.91
	Domain OS	0.18–0.74	0.28–0.70	0.71
	Domain FL	0.02–0.51	0.22–0.54	0.71
	Domain EWB	0.05–0.72	0.17–0.78	0.85
	Domain SWB	0.07–0.76	0.41–0.67	0.86

CPQ: Child Perceptions Questionnaire, OS: Oral Symptoms, FL: Functional Limitations, EWB: Emotional Well-Being, SWB: Social Well-Being, IIR: Inter-Item Correlation, ITR: Item-Total Correlation.

It was possible to compare records of 1365 parents with records of their children who independently each from other assessed items of the OS and FL domains of child OHRQoL (Table 5). Across all age groups of adolescents, positive significant correlations between parental and children assessments were observed for sum scores of both domains whereas these correlations were evaluated as a moderate level. The moderate values of kappa and ICC also confirmed agreement between child and parental reports. These results suggest on reliability of two subscales of the CPQ in respect of repeatability by two different raters.

Table 3. Spearman correlation of the Child Perceptions Questionnaire and its domains with rating of oral health, oral well-being and global life satisfaction, by age groups

Age group	CPQ/Domain	Oral health	Oral well-being	Global life satisfaction
11–14 (N=307)	CPQ	0.36**	0.49**	-0.33**
	Domain OS	0.33**	0.48**	-0.26**
	Domain FL	0.24**	0.36**	-0.17**
	Domain EWB	0.31**	0.38**	-0.32**
	Domain SWB	0.18**	0.28**	-0.17**
15–16 (N=721)	CPQ	0.46**	0.52**	-0.33**
	Domain OS	0.36**	0.49**	-0.23**
	Domain FL	0.33**	0.41**	-0.21**
	Domain EWB	0.37**	0.39**	-0.29**
	Domain SWB	0.26**	0.29**	-0.23**
17–18 (N=563)	CPQ	0.49**	0.58**	-0.27**
	Domain OS	0.44**	0.58**	-0.22**
	Domain FL	0.28**	0.47**	-0.15**
	Domain EWB	0.42**	0.42**	-0.23**
	Domain SWB	0.28**	0.34**	-0.17**

CPQ: Child Perceptions Questionnaire, OS: Oral Symptoms, FL: Functional Limitations, EWB: Emotional Well-Being, SWB: Social Well-Being, ** $p < 0.01$.

Discussion

This innovative study was aimed to validate the CPQ among adolescents aged from 15 to 18 in the population survey of orthodontic anomalies in Lithuania. As a reference age group was chosen a group of adolescents aged 11–14 years. The main findings of our study showed that the CPQ instrument is valid to adolescents aged 15–18 years as well as it is valid for adolescents aged 11–14 years.

According to the literature review, most of the OHRQoL studies has focused on 11–14-year-old adolescents rather on older teens. This fact is not surprising because OHRQoL is often the key motive for seeking orthodontic treatment and can be considered the measurement for orthodontic treatment need and outcome.[35–37] It also relates to the fact that children of this age group make up the majority of orthodontic patients. During this age period, the whole body, including the jaws, develops intensively. So the orthodontic anomalies that has arisen in this age period can be successfully corrected, even it is assumed that it is not possible to complete a full course of orthodontic treatment before the premolars and second permanent molars have erupted at dental age 12 or 13 years.[38] Therefore, it increasingly recognized that more and more teenagers and young adults are seeking correction of their malocclusion, if this could not be done in early adolescence. Thus, orthodontists should be aware that such patients might expect orthodontic treatment to provide not only improved oral functioning and health but also enhancement of aesthetics, self-esteem and social life.[39]

More recently, a number of tools to measure OHRQoL has been developed and used in assessing an association between severity of malocclusion and patients' perception of their oral health status. The standard CPQ_{11–14} was developed to measure the OHRQoL among adolescents between the ages of 11 and 14 years in Canada

[12] and soon validated in many languages and cultures, including such as China,[40] India,[16] Korea,[21] Saudi Arabia,[22] and others. The questionnaire was also adapted to Lithuanian adolescents (Kavaliauskienė A, Šidlauskas A, Zaborskis A., 2018. Manuscript under review). After examination its psychometric properties, the Lithuanian version of CPQ₁₁₋₁₄ showed good internal consistency, discriminant validity and acceptable agreement between children and

parental responses to the same items. However, there are few studies in which the well-known CPQ would be used to measure OHRQoL in adolescents over the age of 14 years.[24–27] So we felt the lack of an instrument suitable for measuring OHRQoL throughout all adolescence period as the investigation of orthodontic anomalies among adolescents of Lithuania was targeted to the population aged from 11 to 18 years.

Table 4. Discriminant validity of the Child Perceptions Questionnaire and its domains for clinically recorded and self-reported malocclusion, by age groups

Age group	Dental health malocclusion	N	Median (IQR) of relative scores				
			CPQ	Domain OS	Domain FL	Domain EWB	Domain SWB
11–14	<i>Records from orthodontic examination:</i>						
	ICON≤43	121	5.4 (2.7–12.4)	16.7 (11.1–27.8)	3.7 (0–7.4)	3.7 (0–16.7)	0 (0–2.6)
	ICON>43	56	6.3 (3.2–33.3)	16.7 (11.1–27.8)	3.7 (0–7.4)	7.4 (0–18.5)	0 (0–2.6)
	<i>p</i>		0.245	0.872	0.946	0.307	0.753
	IOTN≤3	138	5.4 (2.7–11.7)	16.7 (11.1–27.8)	0 (0–9.3)	3.7 (0–14.8)	0 (0–2.6)
	IOTN>4	57	6.3 (2.7–11.9)	16.7 (11.1–27.8)	3.7 (0–7.4)	7.4 (0–18.5)	0 (0–2.6)
	<i>p</i>		0.738	0.375	0.461	0.046	0.931
	<i>Self-reported malocclusion:</i>						
	‘healthy’	136	5.4 (2.7–9.9)	16.7 (5.6–27.8)	3.7 (0–10.2)	3.7 (0–11.1)	0 (0–2.6)
	‘not healthy’	170	8.1 (5.6–27.8)	22.2 (11.1–33.3)	3.7 (0–14.8)	9.3 (0–22.2)	0 (0–5.1)
	<i>p</i>		<0.001	0.009	0.119	<0.001	0.076
15–16	<i>Records from orthodontic examination:</i>						
	ICON≤43	293	5.4 (2.7–12.6)	16.7 (11.1–27.8)	3.7 (0–11.1)	3.7 (0–14.8)	0 (0–2.6)
	ICON>43	114	8.1 (3.6–16.2)	22.2 (11.1–33.3)	3.7 (0–14.8)	7.4 (0–19.4)	2.6 (0–5.1)
	<i>p</i>		0.011	0.240	0.290	0.082	0.013
	IOTN≤3	280	5.4 (2.7–13.5)	16.7 (11.1–27.8)	3.7 (0–11.1)	3.7 (0–14.8)	0 (0–2.6)
	IOTN>4	138	6.3 (2.7–13.7)	19.4 (11.1–33.3)	3.7 (0–11.1)	7.4 (3.7–34.3)	2.6 (0–5.1)
	<i>p</i>		0.463	0.250	0.720	0.038	0.039
	<i>Self-reported malocclusion:</i>						
	‘healthy’	311	4.5 (1.8–9.0)	16.7 (5.6–27.8)	3.7 (0–7.4)	0 (0–7.4)	0 (0–2.6)
	‘not healthy’	409	7.2 (3.6–15.3)	22.2 (11.1–33.3)	3.7 (0–11.1)	7.4 (0–18.5)	2.6 (0–5.1)
	<i>p</i>		<0.001	<0.001	0.048	<0.001	0.001
17–18	<i>Records from orthodontic examination:</i>						
	ICON≤43	210	6.3 (2.7–10.8)	16.7 (11.1–33.3)	3.7 (0–8.3)	3.7 (0–11.1)	0 (0–2.6)
	ICON>43	74	9.0 (5.2–18.5)	22.2 (11.1–38.9)	3.7 (0–11.1)	14.8 (3.7–34.3)	2.6 (0–5.1)
	<i>p</i>		0.018	0.499	0.910	<0.001	0.045
	IOTN≤3	189	6.3 (2.7–10.8)	16.7 (11.1–27.8)	3.7 (0–7.4)	3.7 (0–11.1)	0 (0–2.6)
	IOTN>4	109	9.0 (5.4–17.1)	22.2 (11.1–38.9)	3.7 (0–11.1)	11.1 (0–25.9)	2.6 (0–5.1)
	<i>p</i>		0.030	0.095	0.260	<0.001	0.024
	<i>Self-reported malocclusion:</i>						
	‘healthy’	237	4.5 (1.8–9.9)	16.7 (8.3–27.8)	0 (0–7.4)	0 (0–7.4)	0 (0–0)
	‘not healthy’	323	8.1 (3.6–14.4)	22.2 (11.1–38.9)	3.7 (0–11.1)	7.4 (0–22.2)	2.6 (0–2.6)
	<i>p</i>		<0.001	0.011	0.096	<0.001	0.007

CPQ: Child Perceptions Questionnaire, OS: Oral Symptoms, FL: Functional Limitations, EWB: Emotional Well-Being, SWB: Social Well-Being, IQR: Range from 1st to 3rd quartile, *p*: Test to compare medians across groups (significant values are in bold).

Table 5. Agreement between child and parental reports about oral symptoms and functional limitations

Age groups	Domain	Number of compared pairs	Spearman correlation coefficient	Quadratic weighted kappa	Intraclass correlation coefficient (95% CI)
11–14	Domain OS	255	0.42**	0.40**	0.56 (0.43–0.65)
	Domain FL	255	0.31**	0.33**	0.43 (0.27–0.55)
15–16	Domain OS	630	0.32**	0.32**	0.53 (0.46–0.60)
	Domain FL	637	0.34**	0.40**	0.58 (0.51–0.64)
17–18	Domain OS	469	0.39**	0.32**	0.56 (0.47–0.63)
	Domain FL	473	0.34**	0.38**	0.56 (0.47–0.63)

OS: Oral Symptoms, FL: Functional Limitations, CI: Confidence Interval, ** p<0.01.

Adolescence is marked as a transitional period of rapid developmental changes and often perceived as a time of changing trajectories and health across the life course.[29, 41] It is reasonable that adolescents of the older stage are very different from those of the younger age stage. Older teen like young adults are capable of abstract thinking, reasoning about the past events and relating them with good or bad consequences in health.[41] Based on this assumption, we hypothesised that the CPQ instrument to measure OHRQoL among 15–18-year-old adolescents could be as much valid as it was valid for adolescents aged 11–14 years. The hypothesis was confirmed by all tests traditionally employed in questionnaire validation procedures.

Initially, it was found that the distribution of CPQ sum scores and its ratio between males and females did not differ significantly across age groups of adolescents. This may suggest that the impact of malocclusion over all adolescence does not decrease as age increases. However, our study was limited to adolescents up to 18 years, while other studies among adolescents and young adults demonstrated a negative association between age and impact on quality of life due to malocclusion.[42] Exploring gender differences, regardless of age, girls were found to be more emotionally concerned with their teeth aesthetic or, alternatively, boys may be less self-conscious about their appearance. Similar findings were reported by Peres et al.[43] who found females adolescents having greater dissatisfaction with their dental appearance (Peres et al., 2008) but in the other studies the gender difference was not established significant.[44]

Next, a good internal consistency reliability of the total CPQ with Cronbach’s alpha equal to 0.90 was established in both 15–16 and 17–18 age groups and was as high as in the 11–14 age group presented in our study or reported by other authors.[12] Despite the adolescent age, the alpha coefficient for the EBW and SWB domains was also greater than 0.80. Similarly to the other CPQ validation studies,[16,17] the lowest values of Cronbach’s alpha were observed for the OS and FL domains. Many methodologists[33, 34] recommend a minimum alpha coefficient between 0.65 and 0.8 (or higher in many cases), thus the obtained values that varied from 0.66 to 0.73 could be considered acceptable for these domains in all age groups.

The correlation coefficients in the construct validity analysis were significant in all age groups. So construct validity of the questionnaire

in survey of older adolescents was in any case as high as that found among the youngest adolescents. Compared with other studies,[17, 20] which considered the CPQ valid for the population being assessed, the correlations between the respondents’ global rating of oral health and well-being and the CPQ sum scores outlined in our study were higher in many cases. The construct validity of the questionnaire for all age groups was also confirmed by the significant relationship between CPQ of sum scores and the adolescent’s global life satisfaction that is an essential dimension of young people well-being.[45] The relationship indicated that adolescents, regardless of their age, were more likely to report lower global life satisfaction when they felt any oral health-related complaints.

A discriminant validity of the CPQ was examined comparing the distribution of the CPQ scores between groups of adolescents with regard to their subjectively perceived and objectively measured orthodontic status. We found that malocclusion experience has a negative impact on the adolescents’ perceptions but its strength (difference in the CPQ distribution) differed by the method of definition of severity of malocclusion and the age of adolescents. Adolescents who reported malocclusion complaints themselves (were ‘not healthy’ in respect to orthodontic status) were more likely to provide greater perceptions of oral health-related problems than adolescents with clinically defined need for orthodontic treatment. This finding shows that a malocclusion can be perceived differently by the affected person, and a person’s degree of awareness of their malocclusion might not be related to its severity.[42] The findings of the study also suggest that young adolescents when evaluating their malocclusion by orthodontist mainly suffer emotional problems, as their OHRQoL might not be related so much with severity of malocclusion. Previous studies examining the impact of malocclusion on children (young adolescents) oral health-related perceptions have been also equivocal. Systematic reviews of literature on this issue reported studies that claimed evidence for a clear inverse association of malocclusion with OHRQoL.[46–48] At the same time, they reported studies with no clear relationship indicating that the strength of the association differed depending on the age of studied sample and cultural environment. In part, our findings confirmed this suggestion indicating that in older adolescents clinically defined need for orthodontic treatment may have a significant effect on perceived OHRQoL in more domains. Therefore, in respect of discriminant validity, the CPQ had no disadvantages both in the younger and older adolescents groups.

Finally, test-retest reliability of the CPQ instrument was not assessed due to organizational and logical reasons. With regard to organizational reasons, a retest appeared problematic as organizing another dental examination session at all of the schools participating in our study would have a complex endeavour. With the respect to logical reasons, a retest of the same students was replaced with an alternative analysis that included comparison of children’s and their parents’ answers to the same questions of the OS and FL sub-scales. Such comparison was not performed for the EBW and SWB sub-scales, because some parents may have limited knowledge about their children’s OHRQoL, particularly the impact on social and emotional well-being.[49]. As in other similar studies in this field,[49–51]

findings of the present study confirmed an agreement between child and parental reports suggesting on reliability of the PCQ in respect of its repeatability by two different raters.

As an advantage of this study may be the fact that data were collected in cross-sectional population survey of representative adolescents' sample but not within sample of patients attending dental treatment as in several studies.[12, 24,52] The adolescents completed their questionnaires at school anonymously without any influence of their parents' and dentist's opinion, thus, adolescents could express their own feelings towards their QoL. That was an important condition comparing children's and their parent responses, as well as their perceptions and orthodontic measures. This is the first study on OHRQoL among adolescents ever to be carried in Lithuania.

In terms of the limitations of our study, we conducted oral examination with respect to orthodontic disorders without assessing of dental cariousness and periodontal conditions that would have a considerable impact on OHRQoL in adolescence.[53–55] The sample was not also homogenous with respect to previously conducted orthodontic treatment. So, the possible confounding effects of these conditions on the participants' OHRQoL were not considered in the analysis. Another limitation of the research is that we worked on the “long form” (37 items) of the original CPQ_{11–14} together with other scales, including such as eating behaviour and self esteem. Our experience from the HBSC study [29] showed that an increase of number of items in the questionnaire may affect respondent's accuracy providing inaccurate answers, which may, consequently, reduce reliability of the tested scale. Finally, test-retest reliability of the CPQ instrument was replaced with an alternative analysis that included comparison of children's and their parents' responses to the same questions of the OS and FL domains. This approach is not free from limitations, especially in relation to its accuracy because children and parents may not share the same views about illness and health.[56]

Conclusions

The Lithuanian version of the CPQ showed good internal consistency and construct and discriminant validity in all age groups of adolescents, consequently, it seems to be a valid instrument for measuring OHRQoL among adolescents aged 15 to 18 years as well as among adolescent aged 11 to 14 years.

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Competing interests

The authors declare that they have no competing interests.

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Abbreviations

CI	Confidence Interval
CPQ	Child Perceptions Questionnaire
DHC	Dental Health Component
EWB	Emotional Well-being
FL	Functional Limitations
HBSC	Health Behaviours in School-aged Children
ICC	Intraclass Correlation Coefficient
ICON	Index of Complexity Outcome and Need
IIR	Inter-Item Correlation
IOTN	Index of Orthodontic Treatment Need
IQR	Interquartile Range
ITR	Item-Total Correlation
OHRQoL	Oral Health-Related Quality of Life
OS	Oral Symptoms
SD	Standard Deviation
SWB	Social Well-being

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