ORIGINAL ARTICLE

The German version of the Child Perceptions Questionnaire (CPQ-G11-14): translation process, reliability, and validity in the general population

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Abstract The aims of this study were to develop a German version of the Child Perceptions Questionnaire (CPQ11-14, a measure of oral health-related quality of life in 11–14-year-old children) and to assess the instrument's reliability and validity in German children ages 11–14. The English original version of the CPQ11-14 questionnaire was translated into German (CPQ-G11-14) by a forward–backward translation method. Reliability was investigated

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Department of Pediatric Dentistry, University of Leipzig, Nuernberger Strasse 57, 04103 Leipzig, Germany in 1.061 subjects aged 11–14 years from a regional sample (Wernigerode, Saxonia-Anhalt, Germany) who were recruited during the annual dental public health examination. The subjects completed the CPO-G11-14 and were clinically examined for the presence of dental caries, plaque accumulation, and malocclusion. In the reliability assessment, questionnaire summary score test-retest reliability was excellent (intraclass correlation coefficient, 95% confidence interval (CI)=0.83, 0.73-0.94) and internal consistency was satisfactory (Cronbach's alpha, lower limit of CI=0.87, 0.86). Validity of the CPQ-G11-14 questionnaire was supported by correlations with global ratings of oral health and overall well-being that were moderate in magnitude and met expectations (r=0.35; 95% CI, 0.30-0.40 and r=0.30; 95% CI, 0.24–0.35, respectively). In conclusion, the German version of the CPQ11-14 was reliable and valid in a general population of 11-14-year-old German children.

Keywords Oral health-related quality of life (OHRQoL) · Child Perceptions Questionnaire (CPQ) · Psychometric properties · Reliability · Validity

Introduction

To assess oral health, the concept of oral health-related quality of life (OHRQoL) is equally important in children and in adults. However, compared with adults, where more than 16 instruments exist [1], only a few OHRQoL instruments are available for children, and cross-cultural adaptation of these largely English language instruments is rare. The Medical Outcome Trust has made the existence of such instrument versions a criterion for the assessment and review of health-related quality of life instruments [2] because comparability of findings is severely limited without validated questionnaire versions covering different cultures and settings.

One of the more frequently used instruments to assess OHRQoL in children is the Child Perceptions Questionnaire, CPQ11-14, which was originally developed in Canada [3]. Several studies show the process of translation, cultural adaptation, and validation of long and short forms of the Child Perceptions Questionnaire (CPQ11-14) for different countries and cultures making the questionnaire a promising tool for international collaboration: Australia [4], Brazil [5, 6], China [7], Denmark [8], New Zealand [9, 10], Saudi Arabia [11], United Kingdom [12, 13].

The aims of this study were to develop a German version of the Child Perceptions Questionnaire CPQ11-14 and to assess the instrument's reliability and validity in a general population of 11–14-year-old German children.

Materials and methods

Development of the German CPQ11-14

The English language self-complete Child Perceptions Questionnaire to determine the frequency of various oral health-related impacts in 11-14-year-olds (CPQ11-14) was developed and validated in Toronto, Canada [3]. The authors developed a pool of 50 items, and 35 of these items were selected for inclusion in the final questionnaire by means of an item impact study [14, 15]. The questionnaire contains four domains: oral symptoms (five items), functional limitations (ten items), emotional wellbeing (eight items), and social well-being (12 items). Questions ask about the frequency of events in the previous 3 months. Responses are made on an ordinal scale (0=never, 1=once/twice, 2=sometimes, 3=often, 4=every day/ almost every day). Domain scores and an overall CPQ11-14 score are generated by summing the response codes for the questionnaire items. The instrument summary score ranges from 0 to 140, and it represents a "problem index" that characterizes the severity of OHRQoL impairment. A "0" summary score indicates the absence of any problems, and higher CPQ scores represent more impaired OHRQoL. In addition to the 35 items, the CPQ11-14 includes two questions asking the child for a global rating of his or her oral health and his or her overall well-being. These global ratings have a five-point response format (excellent, very good, good, moderate, poor).

Following accepted standards for the cross-cultural adaptation of health-related quality of life questionnaires [16], we translated the original English language items into German. Two native Germans with extensive knowledge of the English language and experience in translating health-

related questionnaires carried out two independent translations. Both translations were merged into one version. This version was back-translated into English by two native English speakers. Finally, these two versions were synthesized, resulting in the final questionnaire. Originally, Jokovic et al. developed a pool of 50 items and 35 of these items were selected in their study for inclusion in the final questionnaire by means of an item impact study. To achieve compatibility with the English language and most other language versions, we only used the 35 items suggested by the original questionnaire authors. This final questionnaire (CPO-G11-14) was compared with the original English language instrument. A committee consisting of the two forward translators, the two back translators, and a methodologist supervised the entire translation process.

Assessment of reliability and validity in the general population of 11–14-year-olds

Subjects and setting

During the annual dental public health examinations conducted from September 2007 until April 2008, 1,061 students (11-14 years old; mean age, 12.3±1.1 years, 52.8% female) were recruited from a midsize town (Wernigerode, Saxonia-Anhalt, Germany). These children were clinically examined by one examiner who was calibrated in accordance with the WHO basic methods criteria [17]. The examinations took place at the children's school. The DMFT (sum of decayed, missing, and filled teeth in the permanent dentition) index and its components were used to assess caries status. Dental plaque accumulation was assessed using the simplified additive index for plaque accumulation described by Ambjørnsen et al. (score "0"=no visible plaque, score "1"=visible plaque (per subject)) [18]. The presence of malocclusion was measured by the presence of indicators suggested by Klink-Heckmann et al. [19]. Prior to the dental examination, each child completed the CPQ-G11-14.

At the time of enrollment in the study, parents signed an informed consent form before a child's verbal assent was sought. A child's dissent superseded the parental consent. When a child's verbal assent was obtained, the assent was documented. The study protocol was approved by the Institutional Review Board of the University of Leipzig.

Reliability assessment

We investigated the domain and instrument summary scores' internal consistency and temporal stability. To determine internal consistency, we calculated Cronbach's alpha [20]. According to guidelines [21], Cronbach's alpha

values of 0.70-0.80 are considered "satisfactory" for a reliable comparison between groups. To determine the temporal stability of scores, test-retest reliability was assessed in 35 children aged 11-14 years, who were a convenience sample of the 1,061 children in Wernigerode. The interval between the first test interview and the retest interview was 3 weeks. The test-retest reliability was assessed by calculating intraclass correlation coefficients (ICC) based on a one-way repeated measures analysis of variance, using summary CPQ scores from the repeated administration of the tests [22]. According to guidelines [23], reliability coefficients >0.75 are considered excellent. We also tested whether CPQ-G11-14 scores were stable over time using a paired t test to assess statistical significance. A p value of < 0.05 was considered statistically significant.

Validity assessment

To ensure that the instrument measured what it is supposed to measure, score validation was performed. We followed the approach taken by the original CPO11-14 authors and the developers of other language versions to be compatible with previous validation efforts. Therefore, construct validity was determined by computing Spearman's rank correlations of the scores for the total scale and each domain with the children's self-reported global rating of oral health (excellent, very good, good, moderate, or poor) and self-reported global rating of overall well-being (excellent, very good, good, moderate, or poor)-two global indicators of perceived oral health. According to previous research, we expected "moderate" (0.30-0.49 according to Cohen [24]) correlations between CPQ-G11-14 scores and the two global health questions, with a larger correlation with oral health than with general health expected.

In addition to our convergent validity analyses, we performed (known) groups validation where we determined to what degree CPQ-G11-14 scores demonstrate (or do not demonstrate) different scores for groups known or not known to vary in their OHRQoL in children. We investigated the differences in groups of subjects according to three major indicators of physical oral health: the DMFT index (0–2 versus >2, 0 versus >0 for the DM components), the plaque accumulation index (absent versus present), and the presence of malocclusion. The DMFT index was dichotomized into 0–2 versus >2 and into 0 versus >0 when subjects with different DM components were compared. The plaque accumulation index was categorized into absent versus present plaque. Malocclusion was also dichotomized into absent versus present.

We tested CPQ-G11-14 group differences for the four variables using the Mann–Whitney test. We also calculated

point–biserial correlation coefficients to determine the magnitude of the correlation between physical oral health indicators and CPQ-G11-14 scores. According to previous studies, we expected no differences in CPQ-G11-14 summary scores between subjects with more compared with less caries or plaque accumulation. When judged by Cohen's guidelines for the magnitude of correlations, we expected correlations to be less than "low" (0.10–0.29). We expected that children with malocclusion would have more impaired OHRQoL as measured with the CPQ-G11-14 than children without malocclusion. In terms of a magnitude of correlation, we expected low correlations of CPQ-G11-14 summary scores with malocclusion.

Results

Aim 1: development of the German CPQ11-14

The German CPQ11-14 contains a total of 35 questions: five questions on oral symptoms, ten questions on functional limitations, eight questions on emotional wellbeing, and 12 questions on social well-being. Questions concerning oral symptoms and social well-being were easier to translate than questions concerning functional limitations and emotional well-being. In the population sample, the children were able to answer all questions on the German instrument. When approached by survey personnel as to whether they had questions or needed assistance, the children indicated that they understood all questions. Therefore, no wording of the questionnaire had to be changed. No missing items were encountered. The majority of children completed the questionnaire in approximately 6–7 min.

Aim 2: assessment of reliability and validity in the general population

Reliability

In an examination of temporal stability, CPQ-G11-14 scores decreased slightly but statistically significantly over the test-retest time period of 3 weeks (Table 1). For the subscales, the largest change was observed for the functional limitations domain and the smallest change was observed for the oral symptoms domain. Regardless of the slight OHRQoL improvement when none was expected, the ICC for the CPQ-G summary score was high (0.83). The ICCs of the four domain subscales ranged between 0.42 and 0.78. According to guidelines [23], "excellent" reliability was achieved for the summary score and for the oral symptoms subscale (>0.75). The three remaining subscales achieved "fair to good" reliability. Internal consistency

	Number	Internal consistency (N=1	,061)	Test-retest reliabil	ity (N=35)
	of items	Cronbach's alpha (lower limit of 95% CI)	Average interitem correlation	ICC (95% CI)	Mean CPQ score difference, difference time 1-time 2 (95% CI)
Total scale	35	0.87 (0.86)	0.16	0.83 (0.73-0.94)	2.36 (0.81-3.91)
Subscales					
Oral symptoms	5	0.60 (0.57)	0.23	0.78 (0.64-0.91)	0.36 (-0.25-0.97)
Functional limitations	10	0.67 (0.64)	0.17	0.70 (0.53-0.87)	1.00 (0.51–1.49)
Emotional well-being	8	0.78 (0.76)	0.31	0.59 (0.37-0.81)	0.47 (0.39–1.33)
Social well-being	12	0.75 (0.73)	0.20	0.42 (0.14–0.69)	0.53 (-0.16-1.22)

Table 1 CPQ-G11-14 score reliability in general population subjects

CI confidence interval

(Cronbach's alpha) for the summary score was 0.87. For the domains, the coefficient ranged between 0.60 (for oral symptoms) and 0.78 (for emotional well-being), reaching "satisfactory" reliability [21] for two of the four domains (0.70–0.80). Average interitem correlation—another measure of the scores' internal consistency—ranged between 0.16 and 0.31.

Validity

CPQ-G11-14 scores correlated well with other measures of the same construct (convergent validity). The scores' correlations with global ratings of oral health and overall well-being were in the predicted magnitude (0.35 and 0.30, respectively) and were statistically significant (Table 2). As expected, the coefficient was slightly higher for the rating of oral health than for the rating of overall well-being.

When subjects were grouped according to major physical oral health indicators (caries, plaque accumulation, and malocclusion), the magnitude of the CPQ-G11-14 scores' correlations were as expected. In general, perceived oral health as measured with the CPQ-G11-14 summary score and physical oral health did not correlate substantially. Nevertheless, some differences could be found. As predicted, summary score differences in children with and without malocclusion were present and statistically significant (P=0.0001), but differences in children with different levels of caries or plaque accumulation were essentially absent and statistically not significant (P=0.26 and P=0.24, respectively).

Discussion

This study adapted the original English language CPQ11-14 version to the German cultural environment and investigated its psychometric properties in a general population of 11–14-year-old German children. The translation and cross-cultural adaptation were carefully conducted following the four-step procedure recommended by Beaton et al. [16]. This process resulted in a back-translated version (CPQ-G11-14) that was very similar to the original. CPQ-G11-14 scores were reliable and valid in the general population.

The study was performed with the 35 items suggested by the original authors [3]. Later publications have used a 37item version. However, we believe that a German version containing 37 items would have similar psychometric properties.

The results from the reliability assessment were similar to findings from previous studies. For the evaluation of test-retest reliability, the time interval between the administrations of the questionnaires was restricted to 3 weeks in the current study. Test-retest reliability for the CPQ-G11-14 summary score was excellent according to guidelines, which was in agreement with previous studies that used a time interval of 2-3 weeks [3, 5]. Score reliability for domain scores was lower than expected. Jokovic et al. and Marshman et al. found slightly higher values [3, 12]. When we examined internal consistency as another form of reliability, Cronbach's alpha coefficient was high for the summary score (0.87), indicating adequate internal reliability, as reliability of 0.5 or above is considered acceptable [20, 23]. For the domains, the coefficient ranged from 0.60 for the oral symptoms domain to 0.78 for the emotional well-being domain. Differences in Cronbach's alpha among domain scores were also influenced by the length of the scale. For example, the oral symptoms domain with five items and the functional limitations domain with ten items had different Cronbach's alpha but almost identical average interitem correlations-another measure for the scores' internal consistency. Our internal consistency results were similar to findings by Jokovic et al. (α =0.91 for the summary score, 0.64-0.86 for domain scores) [3], Goursand et al. (α =0.86, 0.52–0.86) [5], and Brown et al. (α =

- ברע-טוו	14 score v	anduty in ger	ierai population subje	cts: correla	tions with self-reported	i oral and	general nealth as we	ell as carles	s, plaque accumulation	n, and mai	occiusion
	Number	Total scale	(35 items)	Oral symp	toms (5 items)	Functions (10 items	al limitations	Emotiona	l well-being (8 items)	Social we	ell-being (12 items)
		$\overline{x}(SD)$	r (95% CI)	$\overline{x}(SD)$	r (95% CI)	$\overline{x}(SD)$	r (95% CI)	$\overline{x}(SD)$	r (95% CI)	$\overline{x}(SD)$	r (95% CI)
Global rating of oral health			0.35 (0.30–0.40)*		0.32 (0.2–0.37)*		0.23 (0.18–0.29)*		0.28 (0.22–0.33)*		0.22 (0.16–0.28)*
Excellent	136	3.7 (4.6)		1.5 (1.7)		1.5 (2.1)		0.4 (1.2)		0.4 (1.4)	
Very good	388	6.4 (6.3)		2.4 (2.0)		2.5 (2.7)		0.8 (1.8)		0.7 (1.6)	
Good	446	8.5 (7.9)		3.1 (2.5)		3.1 (3.2)		1.3 (2.4)		1.0 (2.0)	
Moderate/poor ^a	106	14.3 (9.4)		4.6 (2.9)		4.4 (3.7)		2.9 (3.5)		2.3 (3.6)	
Global rating of			0.30 (0.24–0.35)*		0.29 (0.24–0.35)*		0.22 (0.16–0.27)*		0.21 (0.15–0.26)*		0.17 (0.11–0.22)*
Excellent	214	5.2 (6.6)		1.8 (2.0)		2.0 (2.9)		0.7 (2.1)		0.6 (1.6)	
Very good	451	6.7 (6.2)		2.6 (2.2)		2.5 (2.6)		0.9 (1.7)		0.7 (1.7)	
Good	356	9.4 (8.3)		3.4 (2.6)		3.4 (3.3)		1.5 (2.7)		1.2 (2.2)	
Moderate/poor ^a	67	14.2 (10.6)		4.6 (3.1)		4.6 (4.0)		2.7 (3.5)		2.3 (3.8)	
DMFT			0.04 (-0.02-0.10)		-0.00 (-0.06-0.06)		0.05 (-0.02-0.11)		0.03 (-0.03-0.09)		0.06 (-0.004-0.12)
0-2	940	7.4 (7.4)		2.8 (2.4)		2.7 (3.0)		1.1 (2.1)		0.9 (2.0)	
>2	121	8.3 (7.6)		2.9 (2.7)		2.9 (2.8)		1.3 (2.4)		1.1 (2.1)	
DM			0.03 (-0.03-0.09)		-0.02(-0.08-0.04)		0.00 (-0.06 - 0.06)		$0.05 \ (-0.01-0.11)^{**}$		$0.07 \ (0.01 - 0.13)$
0	984	7.5 (7.4)		2.8 (2.5)		2.7 (2.9)		1.1 (2.1)		0.9 (2.0)	
0<	77	8.5 (8.2)		2.7 (2.8)		2.8 (3.2)		1.6 (3.0)		1.3 (2.3)	
Plaque			$0.07 \ (0.01 - 0.13)^{**}$		$0.05 \ (-0.01 - 0.11)^{**}$		$0.04 \ (-0.02 - 0.10)$		$0.08 \ (0.02 - 0.14)^{**}$		0.03 (-0.03-0.09)
Absent	723	7.1 (7.2)		2.7 (2.3)		2.6 (2.9)		1.0 (2.0)		0.9 (2.0)	
Present	336	8.3 (8.0)		3.1 (2.7)		3.0 (3.2)		1.3 (2.4)		1.0 (2.2)	
Malocclusion			$0.11 \ (0.07 - 0.19)^{*}$		0.06 (-0.01-0.12)**		0.10 (0.05–0.17)*		0.10 (0.0-0.19)*		$0.14 \ (0.08-0.20)^{***}$
Absent	373	6.2 (6.4)		2.6 (2.3)		2.3 (2.5)		0.7 (1.8)		0.6 (1.8)	
Present	688	8.2 (7.9)		2.9 (2.6)		3.0 (3.2)		1.3 (2.3)		1.0 (2.2)	
CI confidence interv	al, <i>DM</i> de	cayed and m	issing								

p < 0.001; p < 0.001; p < 0.05; p < 0.01^a Categories moderate and poor were combined because very few children rated their oral health as "poor" 0.81, 0.65–0.88) [11], indicating that the German CPQ11-14 instrument, when compared with existing CPQ11-14 versions, demonstrated comparable good reliability for the summary score but marginal reliability for domain scores.

Construct validity of the German CPO11-14 was as expected. The correlations between the global ratings of oral and physical health and the summary score were of moderate magnitude, statistically significant, and followed predicted patterns. These findings were in agreement with the majority of previous CPQ questionnaire studies [6, 7, 12]. In a study examining the Brazilian version of the CPO11-14, significant correlations were seen between global ratings of oral health or overall well-being and the summary score and all subscales [25]. In an investigation of the English version of the CPO11-14, significant correlations were observed only between overall well-being and the summary score, the oral symptom domain score, and emotional well-being domain score [3]. No correlation was found between global ratings of overall well-being and the social well-being domain score for the Arabic version of the CPQ11-14 [11].

We compared our results in the current study with previous OHRQoL findings in German adults assessed using the oral health impact profile (OHIP). Here, interestingly, the correlation between OHIP scores and a global indicator of perceived oral health was higher (r=0.56; compared with 0.35 in the present study) [26]. This finding was supported by studies of other OHIP versions in which correlation coefficients of 0.37 and 0.45 were found for Hungarian subjects [27], r=0.40–0.64 was found for Slovenian and Croatian subjects [28], r=0.51/0.59 were found for subjects from Saudi Arabia [29], and r=0.63 was found for Japanese subjects [30]. These findings suggest that, in children, the relationship between OHRQoL and perceived oral health as measured with a global indicator may be different than that in adults.

Furthermore, in agreement with the majority of previous studies, the CPQ-G11-14 discriminated between groups with known differences in dental health [3, 9, 11]. We hypothesized that children with malocclusion would have higher OHRQoL impacts. The findings for the current study indicated that German children with malocclusion did indeed have higher CPQ-G11-14 scores-a finding that supports the importance of malocclusion and its orthodontic treatment in children and adolescents for perceived oral health. When we investigated the relationship of CPQ-G11-14 scores to caries and plaque indicators, the findings were more heterogeneous. We did not find significant differences in CPQ-G11-14 summary scores in groups with and without caries or plaque accumulation, and data regarding correlations between caries and OHRQoL in the literature vary. No association between DMFT and CPQ11-14 scores was observed in the United Kingdom [12] or in Brazil [25].

On the other hand, Jokovic et al. observed a strong correlation in Canadian pedodontic patients between the number of decayed tooth surfaces and CPQ11-14 summary scores [3]. Brown et al. only demonstrated a relationship between DMFT and the oral symptoms domain in the Arabic CPQ11-14 [11]. When taken together, the association between DMFT and CPQ scores in both our current study and the literature seems to indicate that differences between groups of children with different caries experience are small at best. O'Connor hypothesized that the quality of life is strongly influenced by personality and standards of reference [31], making poor correlations between clinical ratings and perceived health-related quality of life scores not unusual.

Conclusion

The German version of the CPQ11-14 questionnaire is a valid and reliable instrument to measure OHRQoL in 11–14-year-old German children in the general population.

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Conflict of interest The authors declare that they have no conflict of interest.

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