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Evaluation of the Parental Perceptions Questionnaire, a component of the COHQoL, for use in the UK.

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Objective To assess the reliability and validity of the Parental Perceptions Questionnaire (PPQ) for use in the UK and to investigate whether different approaches to the treatment of 'don't know' (DK) responses have any effect on the psychometric properties. ***Methods*** The parents of 89 children attending for an examination at a dental teaching hospital and a general dental practice completed the Parental-Caregiver Perceptions Questionnaire (PPQ), global oral health and global impact ratings. Clinical data were also collected. Four approaches were taken to the management of DK responses, one approach involved exclusion of DK responses and three approaches involved adjustment of DK responses (item mean, mean items answered and replacement of DK responses with zero). ***Results*** All four approaches demonstrated acceptable internal consistency and test-retest reliability of the total scale. The mean items answered and replacement approaches had optimal internal consistency of the subscales of the PPQ. Assessments of criterion validity in relation to global oral health rating were similar when the DK responses were adjusted, but the exclusion of DK responses had a detrimental effect. Construct validity of PPQ in relation to global impact rating and clinical data was acceptable only when responses were adjusted. ***Conclusion*** These data suggest that if DK responses are adjusted, the reliability and validity of this measure are acceptable for use in the UK

Key words: Oral health, psychometrics, quality of life

Introduction

Measures of quality of life are increasingly being used to supplement clinical indicators and to explore the impact of conditions on patients. In the case of the quality of life of children, information from parents or carers has been used to supplement child assessments of quality of life or as a proxy for the child assessment (Eiser and Morse, 2001).

The use of parents or carers as proxies has advantages in overcoming some of the concerns about the ability of children to provide assessments that meet psychometric standards, practical problems of reading level and comprehension (Rosenbaum and Saigal, 1996). Indeed, the use of proxies may be the only solution for very young or poorly children (Pantell and Lewis, 1987). However, only modest agreement is found between parents as proxies and children's reports of aspects of quality of life (Achenbach *et al.*, 1987). Eiser and Morse (2001) carried out a systematic review to determine the relationship between the ratings of children's quality of life made by parents and children. The accuracy of proxy ratings varies with the specific domains of quality of life considered. There is greater agreement for observable physical functioning, and less for non-observable dimensions (e.g. emotional or social aspects). Agreement is also better between parents and chronically sick children compared with parents and their healthy children, possibly due to greater communication about illness and treatment. However, the importance of agreement and the common assumption that information from proxies should "match" that provided by children is questioned as proxies and their children may not agree about many issues.

Nevertheless, parents do influence treatment choices, for example the motivation for orthodontic treatment often comes from parents, thus parental information can complement that from children (Stricker, 1970). Involving parents in the assessment of their child's quality of life can also provide an opportunity to raise awareness in parents/caregivers (Inglehart *et al.*, 2002).

The Child Oral Health Quality of Life (COHQoL) questionnaire consists of a Parental-Caregiver Perceptions Questionnaire (PPQ) and Child Perceptions Questionnaires (CPQ) for children aged 8 to 10 years and 11 to 14 years. The measures were developed in response to a lack of a child-specific oral health related quality of life questionnaire (Jokovic *et al.*, 2002). The PPQ was designed to be analogous to the CPQ, to enable it to be used to complement the information gained from the CPQ, and also so that agreement between child and parent could be investigated. The measures are generic and were designed to be used for a wide range of conditions including caries, malocclusions, clefts and other oro-facial anomalies. The COHQoL questionnaires were derived using the item-impact method to ensure the final questionnaires contained items of the most relevance to children with these conditions and their parents (Guyatt *et al.*, 1986).

The PPQ includes 31 questions covering the four domains of oral symptoms (six questions), functional limitations (eight questions), emotional well-being (seven questions) and social well-being (ten questions) and an

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additional fourteen questions on the impact on the family, the Family Impact Scale (FIS). The respondents are asked to indicate, using a six-point Likert scale ('never'=0,'once or twice'=1, 'sometimes'=2, 'often'=3, 'everyday or almost everyday'=4, and 'don't know'), the frequency the events affected their children in the past three months. The PPQ contains a 'don't know' (DK) response specifically because the authors were aware of the limited knowledge a parent may have of their child's activities and feelings. DK response categories are used in other questionnaires to reassure respondents that it is acceptable not to know the answer as well as to minimise guessing (Bowling, 1997). The proportion of participants with at least one DK response was regarded as an essential characteristic of a parent's perception of their child oral health-related quality of life (Jokovic *et al.*, 2003).

The PPQ also includes two global ratings: parent's global ratings of the child's oral health (Atchison and Gift, 1997) and the extent to which the oral/oro-facial condition affects his/her life overall. They are worded, respectively, as follows: "How would you rate the health of your child's teeth, lips, jaws and mouth?" with a 5-point response format ranging from 'excellent' to 'poor' and "How much is your child's overall well-being affected by the condition of his/her teeth, lips, jaws or mouth affect your life overall?" with a response range from 'not at all' to 'very much'. These ratings did not include a DK response.

The reliability and validity of the PPQ in Canada was assessed in 123 parents of children recruited at oro-facial, paediatric dentistry and orthodontic clinics (Jokovic *et al.*, 2002). The internal consistency and test-retest reliability of the scale and subscales were excellent. PPQ scale scores correlated with global ratings of oral health ($p<0.05$) and overall well-being ($p<0.01$) and a significant correlation between overall scale scores and the number of decayed tooth surfaces ($p<0.01$) was demonstrated in the paediatric dentistry group. In the validation of the PPQ in Canada, only the questionnaires with no DK responses were included in the analyses. However, when DK responses were adjusted (by summing the response codes to all items and dividing this sum by the number of items for which a valid response was obtained), equally good validity was found. Several other methods for managing DK responses have subsequently been tested (Jokovic *et al.*, 2004). The different methods for handling DKs did not affect the properties of the PPQ.

The PPQ has not been validated for use in the UK, hence this study aimed to assess the reliability and validity in this setting, and to investigate whether different approaches to the treatment of DK responses had any effect on these psychometric properties.

Method

The evaluation of the PPQ was carried out at the same time as the validation of the CPQ. Parents of a consecutive sample of children attending for an examination at the orthodontic and paediatric dentistry clinics at a teaching dental hospital and one general dental practice were invited to participate. The parents were approached by the clinicians (MS, HR and CM) and consent gained.

A total sample size of 90 (30 parents from each of the three settings) was chosen based on the Canadian CPQ data but allowing for possible cultural differences. In the Canadian study, a Spearman's rank correlation coefficient of 0.54 between the number of decayed teeth and the CPQ scores was found (Jokovic *et al.*, 2002). A correlation coefficient of this magnitude would require a sample of 22 to be significant at an alpha of 0.01.

The PPQ is a self-administered questionnaire and parents were asked to complete it at the time of their child's visit to the clinics. The questionnaire contained 45 items with two global ratings as described previously, and invited parents to take part in the study to assess its test-retest reliability. The follow-up questionnaire included an additional question that asked parents if either the oral/oro-facial condition or its impact on the child's well-being had changed since recruitment. A reference period of three months was used for both administrations of the questionnaire.

The clinical status of the child with respect to dental caries and treatment experience, malocclusion, gingival health and the presence of enamel defects were collected by the calibrated clinicians (MS, HR, CM). Dental caries and treatment experience was assessed by enumerating the number of decayed, missing or filled teeth (DMFT) due to caries (Pine *et al.*, 1997). Malocclusion was categorised by using the dental health component of the Index of Orthodontic Treatment Need (IOTN) (Brook and Shaw, 1989).

The project was approved by the South Sheffield Research Ethical Committee.

Data analysis

Four approaches to analysis of DK responses were employed:

1. Exclusion, only the data from the parents who had not used the DK response were analysed.

Data from all respondents were used in the other three methods for DK response adjustment.

2. Item mean, involved replacing DK responses with the item mean for the entire sample.
3. Mean items answered, involved imputation of the mean score for the items answered.
4. Replacement, involved replacing DK responses with zero value.

Missing values were replaced with the item mean for the entire sample but if participants failed to complete more than one-seventh of the questions they were excluded from the analysis. A similar threshold for excluding missing values has been adopted in other oral health related quality of life research (Slade, 1997).

After taking account of missing or DK responses, the total PPQ score for each participant was calculated by summing the item codes. A second summary measure 'number of impacts' for each participant recorded the number of impacts reported 'often' or 'everyday or almost everyday'. Subscale scores and the FIS score were calculated by summing the codes within these domains

Internal consistency was assessed by means of Cronbach's alpha, and test-retest reliability by means of intraclass correlation coefficient (ICC). The ICC was calculated based on data from parents who participated in the retest study and who did not report that their child's oral health and/or it's impact on their life overall had changed between the two administrations of the questionnaire. This approach was taken to remove the effect of improvements or worsening of oral health in the intervening period between administration of the questionnaire as the test-retest reliability was the property of interest and not the responsiveness of the PPQ to change. This method is consistent with that taken during the development of the COHQoL (Jokovic *et al.*, 2002).

The feasibility of measuring a parent's perception of their child's oral health-related quality of life was assessed by examining the number and distribution of the DK responses as used in parental health related quality of life measures (Varni *et al.*, 1999). The face and content validity were assessed by examining the wording of the questionnaire and the number of missing responses to items. Construct validity was assessed by testing associations of the PPQ scale, subscale scores and the FIS with the life overall scores and the children's clinical data. Criterion validity was examined by comparing the parent's global rating of their child's oral health to summary measures of PPQ and the subscale/FIS score.

Finally, the reliability and validity of the four approaches to the treatment of the DK data were compared.

Results

Ninety-one children participated in the study. No parents refused to participate or to complete the questionnaire. Four participants were excluded due to excessive missing data. Mothers completed 62 (71.3%) of the 87 usuable PPQs. The DK responses adjusted analyses therefore included data from 87 parents. Using the exclusion method, data from 61 parents were analysed after excluding all those respondents who provided one or more DK responses. Respondents providing DK responses were evenly distributed among the three settings and between mothers and fathers.

Overall, the mean DMFT was 1.23 with a mean number of decayed teeth of 0.41, a mean number of missing teeth due to caries of 0.06, a mean number of filled teeth of 0.77 and a mean number of teeth missing for any reason of 0.41. The mean DMFT for 12 year old children in the UK was 0.86 (DT=0.39, MT=0.06, FT=0.41) in 2000/1 (Pitts *et al.*, 2002).

Sixty eight percent of children had an IOTN score of less than 4.64% had good gingival health and 80% did not have enamel opacities. From the UK National Child Dental Health survey 2003, 65% had an IOTN score less than 4.35% had no gingival inflammation and 66% did not have opacities (Lader *et al.*, 2004).

The feasibility of using the PPQ was indicated by the frequency and distribution of the DK responses. In total, 1.7% (n=71) of responses were DK. Four questions accounted for over 50% of these responses, two of which belonged to the symptoms subscale and enquired about the child having food stuck in the roof of the mouth and having food caught in or between the teeth. The third question was concerned with whether their child breathed through the mouth (functional limitation subscale). The final question that elicited high numbers of DK responses enquired about whether their child had been asked questions by other children about their teeth, lips, mouth or jaws (social well-being subscale).

The total score and subscales of the PPQ using the four different approaches to analysis of DK responses are summarised in Table 1. Of the subscales, the highest mean scores were in the symptoms domain.

In the global ratings 20% of parents rated their child's oral health as fair/poor and 11% reported levels of impact on life overall of a lot or very much.

Table 2 summarises the internal consistency derived from the four analytical approaches. The internal consistencies of the total scale derived by each method were acceptable, but the exclusion and item mean approach had sub-optimal reliability (<0.60) for one subscale each.

Most parents completed a follow up questionnaire after two weeks. In the DK exclusion approach, 56% of the parents reported their child's oral health to be unchanged and the ICC was 0.69. In the adjusted approaches, 52% parents could be included in the test-retest analysis with an ICC of 0.92-0.95.

The construct validity assessments are summarised in Table 3, which describes the relationships between life overall rating, clinical data and the measures of PPQ for all four approaches.

For the DK exclusion approach, ratings of life overall were related to both summary measures of PPQ, the emotional and social subscales and the FIS. The number of decayed teeth and the functional subscale of the PPQ were associated, but no other relationships were apparent between the PPQ and clinical variables.

With the item mean approach, global ratings of life overall were related to all PPQ measures except the functional subscale. Significant correlations were found between the 'number of impacts' and the number of decayed teeth and the number of DMFT.

Similarly, the mean items answered approach showed global ratings of life overall to be related to all PPQ measures except the functional subscale. With this third approach, significant correlations were found between the 'number of impacts' and the number of DMFT and also between the emotional subscale and the number of decayed teeth and number of DMFT.

When DK responses were replaced by zero, global ratings of life overall were related to all PPQ measures. A significant correlation was found only between the 'number of impacts' and the number of DMFT.

Table 4 summarises the significant relationships in construct validity assessments using the four approaches.

Criterion validity was examined by comparing the PPQ scores and the global oral health rating (Table 5). In the DK exclusion analysis, the 'number of impacts' and the FIS score were associated with the global rating. In the three DK-adjusted approaches to the handling of DKs, correlation between the summary measures and subscale scores and the global oral health rating were found, but varied between approaches.

Table 1. Mean scores for the subscales of Parental-Caregiver Perceptions Questionnaire and Family Impact Scale (FIS)

Scores	*Range*	*Exclusion mean (SD)*	*Item mean mean (SD)*	*Mean items answered mean (SD)*	*Replacement Mean (SD)*
Total score	0-180	13.5 (12.5)	14.2 (14.5)	14.3 (14.5)	14.2 (14.5)
Symptoms	0-24	3.9 (3.1)	4.1 (3.2)	4.1 (3.3)	4.1 (3.3)
Functional	0-32	2.8 (3.7)	2.8 (3.4)	2.8 (3.4)	2.8 (3.4)
Emotional	0-28	2.4 (3.3)	2.5 (3.6)	2.5 (3.6)	2.9 (4.1)
Social	0-40	1.3 (2.0)	1.5 (2.7)	1.8 (3.0)	1.7 (3.0)
FIS	0-56	2.9 (3.8)	3.3 (4.6)	2.7 (4.1)	2.7 (4.1)

Table 2. Reliability of the total scale, subscales and Family Impact Scale (FIS)

	No. of items	*Exclusion*	*Item mean*	*Mean items answered*	*Replacement*
		Cronbach's alpha	*Cronbach's alpha*	*Cronbach's alpha*	*Cronbach's alpha*
Total scale	45	0.86	0.89	0.92	0.93
Symptoms subscale	6	0.68	0.65	0.71	0.69
Functional subscale	8	0.72	0.52	0.67	0.68
Emotional subscale	7	0.85	0.83	0.85	0.85
Social subscale	10	0.41	0.77	0.79	0.79
FIS	14	0.77	0.87	0.82	0.82

Discussion

This study aimed to assess the reliability and validity of the PPQ for use in the UK. Four approaches tested whether the treatment of DK responses affected the properties of this measure.

Overall, the internal consistency of the total scale and test-retest reliability were acceptable, but the internal consistency (as measured by Cronbach's α) varied between the differing methods of handling the DK responses. There was also variation in the values for the subscales with the mean items answered and replacement method having superior internal consistency (Table 2). These findings contrast with those from Canada where the differing methods had no effect on internal consistency (Jokovic *et al.*, 2004).

Validity was assessed in several ways including looking for relationships between the PPQ scores and clinical data. Significant relationships were found with caries experience data but not with malocclusion, enamel opacities or gingivitis. Other studies have shown a tenuous link between oral health related quality of life measures and clinical data (Cushing *et al.*, 1986; Locker and Slade, 1994).

All adjusted approaches were associated with acceptable validity with only minor variations between approaches.

The exclusion of the DK responses had a detrimental affect on both construct and criterion validity of the measure. The exclusion approach yielded lower values for rank correlations than the other approaches. Again, other studies have not found differences between the different approaches (Jokovic *et al.*, 2002; Jokovic *et al.*, 2004). The difference found in our small study may be due to the reduction in sample size or that the DK response plays an important contribution to the validity of this measure.

Another explanation for the poorer validity with the DK exclusion approach may be that respondents who use DK responses systematically differ from those respondents that don't choose them. In other research the use of DK responses in questionnaires was unrelated to gender, age or social status of the respondent (Ziller and Long, 1965). In this study, DK responses were evenly distributed across the three settings and between mothers and fathers, but we were unable to establish whether there was a relationship between the social status of the participants and the use of DK responses.

Generally, oral health-related quality of life measures do not include DK responses. DK responses can be offered for each question of the Oral Health Impact Profile, but are rarely used. For analysis purposes they are entered as missing values and if more than nine responses were missing or DK the questionnaire is excluded (total number of items=49) (Slade, 1997). When using the Oral Impacts on Daily Performance, missing or DK responses, are adjusted, but respondents with more than two missing items are excluded (Adulyanon and Sheiham, 1997).

The results of the evaluation of the PPQ suggest that if DK responses are included but handled by adjustment, the reliability and validity of this measure are acceptable for use in the UK. As there were only minor differences between the adjusted approaches with respect to validity, from the perspective of reliability and validity, the replacement approach may be marginally the most appropriate method. This method involves replacing DK responses with a zero value and had the highest internal consistency.

Table 3. Relationship between life overall ratings, clinical data and Parental-Caregiver Perceptions Questionnaire (PPQ) scores

A) Exclusion approach

	Total PPQ	No. of impacts	Symptom Subscale	Functional subscale	Emotional subscale	Social sub-scale	Family impact
	r_s	r_s	r_s	r_s	r_s	r_s	r_s
Life overall	0.33*	0.26*	0.06	0.13	0.30*	0.30*	0.41*
IOTN	0.21	0.08	0.18	0.08	0.21	0.18	0.23
Total missing teeth	0.05	0.14	0.10	0.10	0.04	0.06	0.10
Decayed	0.11	0.01	0.23	0.32*	0.07	0.00	0.10
DMFT	0.06	0.14	0.11	0.20	0.02	0.02	0.03
	Total PPQ (p-value)	No. of impacts (p-value)	Symptom Subscale (p-value)	Functional subscale (p-value)	Emotional subscale (p-value)	Social sub-scale (p-value)	Family impact (p-value)
Opacities present	0.9	0.51	0.42	0.98	0.83	0.89	0.90
Gingivitis present	0.73	0.97	0.82	0.96	0.76	0.56	0.57

B) Item mean approach

	Total PPQ	No. of impacts	Symptom Subscale	Functional subscale	Emotional subscale	Social sub-scale	Family impact
	r_s	r_s	r_s	r_s	r_s	r_s	r_s
Life overall	0.40**	0.30**	0.33**	0.20	0.41**	0.31**	0.42**
IOTN	0.12	0.02	0.09	0.03	0.15	0.07	0.08
Total missing teeth	0.02	0.06	0.05	0.09	0.05	0.04	0.09
Decayed	0.08	0.21*	0.01	0.03	0.20	0.14	0.09
DMFT	0.15	0.28**	0.07	0.20	0.22*	0.14	0.16
	Total PPQ (p-value)	No. of impacts (p-value)	Symptom Subscale (p-value)	Functional subscale (p-value)	Emotional subscale (p-value)	Social sub-scale (p-value)	Family impact (p-value)
Opacities present	0.33	0.2	0.30	0.53	0.94	0.59	0.57
Gingivitis present	0.53	0.57	0.53	0.46	0.40	0.99	0.61

C) Mean items answered approach

	Total PPQ	No. of impacts	Symptom Subscale	Functional subscale	Emotional subscale	Social sub-scale	Family impact
	r_s	r_s	r_s	r_s	r_s	r_s	r_s
Life overall	0.40**	0.27*	0.34**	0.20	0.41**	0.36**	0.41*
IOTN	0.12	0.01	0.09	0.03	0.15	0.09	0.70
Total missing teeth	0.01	0.07	0.02	0.06	0.05	0.02	0.07
Decayed	0.08	0.17	0.02	0.15	0.22*	0.08	0.15
DMFT	0.14	0.25*	0.08	0.03	0.22*	0.09	0.19
	Total PPQ (p-value)	No. of impacts (p-value)	Symptom Subscale (p-value)	Functional subscale (p-value)	Emotional subscale (p-value)	Social sub-scale (p-value)	Family impact (p-value)
Opacities present	0.25	0.11	0.22	0.31	0.86	0.51	0.40
Gingivitis present	0.45	0.74	0.49	0.37	0.51	0.85	0.55

Table 3. Continued overleaf...

Table 3. Continued...

	Total PPQ	No. of impacts	Symptom Subscale	Functional subscale	Emotional subscale	Social sub-scale	Family impact
	r_s	r_s	r_s	r_s	r_s	r_s	r_s
Life overall	0.40**	0.27*	0.34**	0.22*	0.41**	0.35**	0.41**
IOTN	0.11	0.01	0.09	0.02	0.15	0.07	0.06
Total missing teeth	0.02	0.07	0.02	0.05	0.04	0.02	0.07
Decayed	0.09	0.17	0.01	0.13	0.18	0.11	0.15
DMFT	0.15	0.25*	0.08	0.01	0.20	0.14	0.19
	Total PPQ (p-value)	No. of impacts (p-value)	Symptom Subscale (p-value)	Functional subscale (p-value)	Emotional subscale (p-value)	Social sub-scale (p-value)	Family impact (p-value)
Opacities present	0.25	0.11	0.22	0.31	0.86	0.51	0.40
Gingivitis present	0.45	0.74	0.49	0.37	0.51	0.85	0.55

r_s =Spearman's rank correlation coefficient, *statistically significant, $p<0.05$, **statistically significant, $p<0.01$, p-values obtained from Mann Whitney U test

Table 4. Relationships from construct validity analyses using four analytical approaches for Parental-Caregiver Perceptions Questionnaire (PPQ) data

	Exclusion	*Item mean*	*Mean items answered*	*Replacement*
Life overall with total PPQ	*	*	*	*
Life overall with 'number of impacts'	*	*	*	*
Life overall with symptoms subscale		*	*	*
Life overall with emotional subscale	*	*	*	*
Life overall with social subscale	*	*	*	*
Life overall with functional subscale		*		*
Life overall with Family Impact Scale	*		*	*
No. of decayed teeth with functional subscale	*			
No. of decayed teeth with emotional subscale		*	*	
No. of decayed teeth with often /everyday		*		
DMFT with number of impacts		*	*	*
DMFT with emotional subscale			*	

*statistically significant relationship, $p<0.05$

Table 5. Rank correlations between Parental-Caregiver Perceptions Questionnaire (PPQ) scores and global measure

	Exclusion	Item mean	Mean items answered	Replacement
	r_s	r_s	r_s	r_s
Total PPQ	0.23	0.25*	0.24*	0.23*
No. of impacts	0.31*	0.20	0.25*	0.25*
Symptoms subscale	0.20	0.24*	0.30**	0.30**
Functional subscale	0.21	0.26*	0.18	0.18
Emotional subscale	0.02	0.06	0.07	0.09
Social subscale	0.07	0.09	0.11	0.10
FIS	0.27*	0.27*	0.27*	0.21*

*statistically significant, $p<0.05$, **statistically significant, $p<0.01$

The feasibility of using parents to supplement information given by children is confirmed by the low number of DK responses. However, an examination of the items that resulted in the highest number of DK responses demonstrates that parents are often not able to detect some unobservable impacts of oral conditions such as 'getting food stuck in the roof of the mouth'. The greater ability of parents to rate their child's health-related quality of life for observable functionning is consistent with the findings of a systematic review (Eiser and Morse, 2001). The Canadian validation of PPQ had similar findings regarding the questions that elicited the highest number of DK responses (Jokovic *et al.*, 2004). The authors of the PPQ considered removing these items but decided against it for fear of compromising the extent to which all aspects of oral health related quality of life are comprehensively covered by the PPQ.

The findings from this study may be of interest when considering the approach to the analysis of parental perceptions of their child's health related quality of life in the future.

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