Dental anxiety and behaviour management problems: The role of parents

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Chapter 3

Exploratory Factor Analysis and Psychometric Properties of the Child Rearing Practices Report

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Abstract

Background

Little research has been done so far to assess the influence of parental rearing on dental anxiety and dental behaviour management problems. In the present study, the Child Rearing Practices Report (CRPR) is used in a clinical child dental population to assess its factor structure and psychometric properties as a basis for future research.

Methods

A total of 307 parents filled out the CRPR questionnaire. Responses were factor analyzed and psychometric properties were assessed.

Results

Although the expected two-factor structure (Nurturance and Restrictiveness) was found, explained variance was insufficient (22.8%), the majority of items did not load on the intended factor and item-intercorrelations were not in an acceptable range. Therefore, it was decided to refine the scales. Factor analysis on these selected items resulted in a clear two-factor structure, with all items loading on the intended factor and an explained variance of 45.8%. Items were selected that constitute a psychometrically sound instrument.

Conclusion

The results of this study suggest that the CRPR can be used in a shorter version. More research needs to be done to assess whether this new shorter questionnaire is consistent among different samples and therefore functions better than the original 40-item questionnaire.

Part one

3

Introduction

Child dental anxiety is of major concern in paediatric dentistry. Lots of investigations are done to explain its aetiology, prevalence and treatment [de Jongh et al., 1995; Klingberg et al., 1995; ten Berge et al., 2002]. Children show their distress in the dental situation by averse behaviour, which can sometimes lead to problems in its management. Behaviour management problems are the main reason for referring children to a paediatric dentist [ten Berge et al., 1999]. Possible referral depends on lots of basic factors, like the availability of an address to refer to, e.g. a special dental care clinic, but also the opinion and attitudes of the parents play a significant role. Though the relation is often put forward and suggested in articles [Hardy et al., 1993], little research is done on the influence of parental rearing on the behaviour and level of anxiety children display during dental treatment. If a (negative) relation does exist, it would be beneficial to train parents how to prepare their children for dental treatment. This could prevent dental anxiety, thereby reducing the child's aversive behaviour, the frequency of behaviour management problems and ultimately, promote dental health in general.

One questionnaire that is often used to assess parental rearing is the Child Rearing Practices Report (CRPR) based on work by Block [1965]. The original CRPR consists of 91 socialization-relevant statements that are administered in a Q-sort format with a forced-choice, seven-step distribution [Block, 1965]. In this method, parents are first asked to sort the statements into three categories "descriptive", "not sure" and "undescriptive". Secondly they are asked to select the most descriptive statements from the "descriptive" pile and the most undescriptive from the "undescriptive" pile, and so on till all statements are divided into seven categories. Although the Q-sort format has certain advantages (e.g., it minimizes the response set and it could be refreshing to use for some subjects) it also has some disadvantages. For instance, it is time-consuming, and the instructions are not easily understood by some subjects. In addition, Block et al. [1981] showed that, when factor analysis is applied to the 91 items, between 28 and 33 factors are found. Obviously, this concerns too many specific scales, with a moderate to low reliability. Sometimes, because a general and more robust measure is needed, attempts have been made to reduce the number of factors.

Rickel and Biasatti [1982] wanted to produce a less time-consuming, and less cumbersome to administer, version of the CRPR, and to derive a more general and meaningful scoring strategy based on a smaller number of factors. They used a questionnaire version to compare to the original Q-sort format of the CRPR. The authors used three different samples representing a wide range of socioeconomic level and race. Responses from the first sample were factor analyzed, resulting in a two-factor solution (nurturance and restrictiveness, 40 items, based on a scree plot and factor loadings > 0.40). Based on this two-factor solution, Cronbach's alpha was calculated for the other two samples. The outcome of this calculation served to "establish reliability and generalizability of the two factor solution". However, the study needs to be criticized on a number of aspects. First of all, calculating and comparing Cronbach's alpha in different samples is by no means evidence of the stability of the factor structure found.

In addition, the authors report that results remained the same regardless of the format used (questionnaire or Q-sort) and that this "indicates generalizability of the results". Although alpha was comparable for sample 1 and 2 (0.85 and 0.84 vs. 0.82 and 0.82), it seemed not quite the same for the third sample (0.61 and 0.73). The latter may be related to the different samples used. The first sample consisted of 211 undergraduates, "many of whom were parents". Unfortunately, it remains unclear how many were actual parents. The second sample consisted of 95 parents attending a parental training sessions (which could limit generalizability), while the third sample consisted of 150 undergraduate psychology students. In other words, the initial factor structure was derived from a sample of students of whom "many" were parents. Next, this structure was tested by calculating alpha in a sample of "normal" parents and undergraduate students. It may be clear that if a subject is not a parent, the instrument measures ideas about parental rearing (rather than actual parental rearing), that need not relate to the real world of parenting. To conclude, it is unclear how the two factors relate to the original Block CRPR [Block, 1965].

The generalizability of the two factor solution was examined by Dekovic et al. [1991]. They used a large representative sample and found comparable internal consistencies (Cronbach's alpha =0.83 and 0.74 resp.) as Rickel and Biasatti [1982]. The two-factor solution, however, only explained 24.0% of the variance for both factors together, with some items loading less than 0.40 [Dekovic et al., 1991]. The level of explained variance is low, especially for two factors, and implies that the instrument does measure more error than latent trait (parental rearing). Next, the authors performed a confirmatory factor analyses (CFA) on the 40 items and concluded that "This result suggests that this two-factor structure adequately represents the data in our sample". However, at first the model did not fit at all. Only after removing the error covariance constraints the Chi2 shows an adequate fit (freeing all constraints for the error covariance is very uncommon). The fit indices, however, indicate a non-adequate fit. So, although the factor structure was replicated in a different sample, results are not very convincing.

To summarize, these results suggest that the 40-item CRPR measures more error than latent trait. It may be clear that measurement error may obscure associations (for instance between factor scores and observed behaviour) or group differences (mean scores between different samples of children). Since the CRPR has a proven track record on parents child rearing research it might be useful for studying the role of the parental rearing style in relation to child dental anxiety and associated behaviour management problems. However, given the mediocre psychometric properties described above, it is necessary to assess how the instrument behaves in a Dutch sample of children, in terms of factor structure and psychometric properties, and to explore whether the instrument can be refined. The aim of this study therefore, is to use the CRPR in a clinical child dental population and assess its factor structure and psychometric properties as a basis for future research.

Materials and Methods

Participants

Participants were parents of 335 children referred to one of the Amsterdam special care dental clinics (ACTA, Centre for Special Dental Care), and a private secondary child dental clinic. During the initial assessment session of these children, the parents were informed about the study by a letter and were asked to participate. Participation was voluntarily and not conditional to treatment. This study was approved by the medical ethical committee of the Free University of Amsterdam (ref. 06/164).

Questionnaires

Parental rearing was assessed using the Child Rearing Practices Report [Block, 1965] which was transformed into a questionnaire by Rickel and Biasatti (1982). This instrument consists of 40 items rated on a 5-point scale ranging from 1 ´totally disagree´ to 5 ´totally agree´ and assesses attitudes, values, goals and behaviours of parents with regard to child-rearing. The instrument consists of two subscales. The subscale relates to parenting practices focusing on control of child behaviour, for example, "I prefer my child not to try things if there is a chance (s)he might fail" The subscale Nurturance relates to parenting practices focusing on sharing feelings, for example, "I express my affection by hugging, kissing and holding my child". The scale has good validity [Dekovic et al., 1991], reliability [Rickel & Biasatti, 1982; Dekovic et al., 1991] and internal consistency [Rickel & Biasatti, 1982], with Cronbach´s alpha´s of 0.85 and 0.84 for the factor restrictiveness and nurturance respectively. All items were translated into Dutch by one of our investigators.

Procedure

Parents were asked to fill out the CRPR during the first treatment appointment of their child. In the Special Dental Care Clinics the absence of the parents during treatment is a part of the procedure. This provided the opportunity to ask parents to fill out questionnaires while waiting for their child. Parents of children with known developmental and psychological problems were excluded from the study. Also parents with insufficient Dutch language skills were excluded.

Statistical analysis

Exploratory factor analysis was performed to test the latent factor structure of the CRPR. Pearson's correlation coefficient was used as a measure of linear association. Cronbach's alpha was used as a measure of internal consistency. The independent samples t-test was used to compare independent mean scores.

3

Results

Descriptive statistics

A total of 335 children participated. Twenty eight questionnaires contained missing values and were left out of the analysis, resulting in 307 subjects. These were 133 girls (mean age=7.08, SD=2.31) and 168 boys (mean age=7.12, SD=2.40). Two children had no data on gender, and four others had no data on age. There was no significant difference in mean age between boys and girls, t(324)=-0.13, p=0.89. The questionnaire was filled out mostly by mothers (70%) and fathers (20%). No significant difference was found between the subscales of the fathers and the mothers (Nurturance p=0.10 and Restrictiveness p=0.15). Mean scores for the total CRPR scale and the subscales scores are presented in Table 1. Boys and girls did not differ significantly on the subscales or total score (p-value range=0.12–0.87). The Pearson correlation between the subscales was non-significant r=-0.10 (N=307, p=0.08), suggesting two relatively independent factors.

Table 1. Mean scores and standard deviations for total and subscale scores.

	Boys		Girls		Total	
	Mean	*SD*	Mean	*SD*	Mean	*SD*
Nurturance	81.0	7.2	82.3	6.5	81.6	6.9
Restrictiveness	62.5	13.3	61.5	14.3	62.1	13.8
Total CRPR	143.5	14.5	143.8	15.0	143.7	14.8

Child Rearing Practices Report (CRPR) scores for boys and girls. No significant differences for the total scale and the subscales were found.

Original questionnaire

First, Cronbach's alpha was calculated for the subscales nurturance (alpha=0.83) and restrictiveness (alpha=0.86), which appear to be in an acceptable range. Inspection of the item-intercorrelation matrix revealed that some items showed negative correlations with other items. The mean and range of the item-intercorrelations can be considered inadequate both for the subscale Nurturance (mean=0.21, range=-0.60–0.59) and for the subscale Restrictiveness (mean=0.21, range=-0.06–0.54).

Next, an exploratory factor analysis was performed on the total questionnaire and the subscales separately. For the total score, this resulted in a solution of 11 factors with an Eigenvalue over 1. However, the scree plot suggested 2 factors. The two factors together explained a modest 28,2% of variance. After rotation (Varimax), the first two factors explained only 22.8% of variance. Only 16 items out of 40 showed their highest factor loading on the relevant factors. For the subscale Nurturance, 5 factors with an Eigenvalue over 1 were found, while the scree plot suggested one factor. The first factor explained 27.2% of variance for the unrotated, and 16.4% for the rotated factor solution. For the subscale Restrictiveness, six factors with an Eigenvalue over 1 were detected, and the scree plot suggested one factor.

This first factor explained 26.1% of variance for the unrotated, and 22.5% of variance for the rotated factor solution. Together, these results suggest that the latent two-factor structure is, although present, not very strong, i.e. there seems to be a lot of unexplained variance, or noise, in the data.

Item selection

For each subscale, those items were selected that had their highest factor loading on the relevant factor. For Restrictiveness, 9 items with a factor loading >0.50 were selected. For Nurturance, only 3 items had a factor loading of >0.50. Therefore, 2 additional items were also selected, with a factor loading below 0.50 (item 1, fl=0.44; item 14, fl=0.40). Next, these selected items were again analyzed using factor analysis. Results are displayed in Table 2 and 3.

Table 2. Exploratory factor analysis on the selected items for Restrictiveness.

Restrictiveness	Mean	*SD*	Factor loading
I do not allow my child to get angry with me	2.28	1.34	0.68
I believe in toilet training a child as soon as possible	2.74	1.39	0.59
I believe children should not have secrets for their parents	3.50	1.35	0.63
T teach my child to keep control of his feelings at all times	3.01	1.34	0.69
I think a child should be encouraged to do things better than others	2.52	1.33	0.67
I believe a child should be aware of how much I secrefice for him	2.29	1.41	0.77
I instruct my child not to get dirty when he is playing	1.58	1.04	0.61
I do not want my child to be looked upon as different from others	2.67	1.43	0.62
I do not think that children of different sexes should be allowed to see each other naked	1.84	1.29	0.61
Total	22.4	7.82	
Alpha=0.83	Explained variance = 42.98%		

Items of the Restrictiveness factor and their loading.

For Restrictiveness (Table 2), one factor was found that explained about 43% of variance. All items showed an excellent loading on this factor. Reliability analysis showed that alpha was 0.83 for this adjusted scale. In addition, mean and range of the item-intercorrelations had improved, mean=0.36 (range=0.22–0.54).For Nurturance (Table 3), one factor was found that explained about 47% of variance. All items showed an excellent factor loading on this factor. Cronbach's alpha for this adjusted scale was 0.75. Although this is somewhat lower than the alpha from the original scale (which was 0.83), it should be noted here that the adjusted scale only consists of a third of the original items. Also for this scale, mean and range of the item-intercorrelations had improved, mean=0.36 (range=0.25–0.60).

Adjusted total scale

To conclude these analyses, the two adjusted subscales were analyzed together. Results

Table 3. Exploratory factor analysis on the selected items for Nurturance.

Nurturance	Mean	*SD*	Factor loading
I respect my child's opinion and encourage him to express it	4.51	0.82	0.62
I am easygoing and relaxed with my child	4.44	0.84	0.61
I joke and play with my child	4.71	0.57	0.78
My child and I have warm intimate moments together	4.75	0.59	0.78
I encourage my child to talk about his troubles	4.83	0.48	0.65
I find it interesting and educational to be with my child for long periods	4.37	0.59	0.67
Total	27.61	2.87	
Alpha=0.83	Explained variance = 47.33%		

Items of the Nurturance factor and their loading.

are displayed in Table 4. Factor analysis resulted in a very clear two-factor structure, with all items loading on the intended factor. The two factors together explained 45.8% of variance. Pearson correlation between the original and adjusted subscales was 0.84 for Nurturance and 0.92 for Restrictiveness.

Discussion

In the present study the CRPR was used in a clinical child dental population to assess its factor structure and psychometric properties as a basis for future research. Responses from 307 parents were analyzed. Cronbach's alphas were in an acceptable range, but the mean and range of the item-intercorrelations was poor. Factor analyses did result in two factors but explained variance was low (22.8% for the two factors together) and comparable to results reported in the literature [Dekovic et al., 1991]. However, this result implies that the CRPR instrument measures more error than latent trait, which is not preferable. In addition, 24 out of 40 items did not load (i.e. had the highest factor loading) on the intended factor. Therefore, it was decided to refine the scales. Only items that loaded >0.50 on the intended factors were selected for further analysis. Two additional items were added (fl>0.40) to the nurturance scale to balance the number of items in both scales. Factor analysis on these selected items resulted in a clear two-factor structure, with all items loading on the intended factor and an explained variance of 45.8%. The explained variance in our new scale is two times more than of the original scale, with only one third of the questions. The result is a 15-item instrument with improved psychometrical properties. However, more research needs to be done to assess whether the new instrument is consistent among different samples and if it functions better than the original 40-item questionnaire.

Despite the promising results in this study, some points need to be discussed. In this study we included only children who were referred to a paediatric dentist because of dental anxiety and/or behaviour management problems. We suggested earlier that the rearing style of these

Table 4. Exploratory factor analysis of the selected items.

	Factors	
Item	Restrictiveness	Nurturance
I respect my child's opinion and encourage him to express it	-0.30	0.58
I am easygoing and relaxed with my child		0.61
I joke and play with my child		0.78
My child and I have warm intimate moments together		0.77
I encourage my child to talk about his troubles		0.65
I find it interesting and educational to be with my child for long periods		0.68
I do not allow my child to get angry with me	0.67	
I believe in toilet training a child as soon as possible	0.60	
I believe children should not have secrets for their parents	0.65	
I teach my child to keep control of his feelings at all times	0.70	
I think a child should be encouraged to do things better than others	0.68	
I believe a child should be aware of how much I secrefice for him	0.76	
I instruct my child not to get dirty when he is playing	0.58	-0.22
I do not want my child to be looked upon as different from others	0.60	
I do not think that children of different sexes should be allowed to see each other naked	0.62	
Variance	26.3%	29.5%

After item selection, the two factors Nurturance and Restrictiveness explained 45.8% of variance (only factor loadings > 0.20 are displayed.

3

parents might differ from the rearing style of children without those dental problems. Although we were not able to show this difference in our first study [Krikken & Veerkamp, 2008] we cannot exclude that the factor structure is somewhat influenced by the sample chosen. Most questionnaires (70%) were filled out by the mother of the child, whereas another 20% was filled out by the father. The remaining questionnaires were filled out by another relative of the child (mostly grandparents). From the literature little is known about the difference in answering between mothers and fathers. However parental agreement on the CRPR was significantly related to the quality of psychological functioning in boys and girls from 3-7 years of age [Block et al., 1981].

The mean item scores for the Nurturance factor are all very high (>3.9). Therefore the overall spread is low. It seems that all parents agree with the items in this factor. All parents care for their child, spent warm moments with them and play with their children. So this factor does not differentiate well between parents (if parents do differ on these items). The items might be especially sensitive to social desirability (i.e., the subject's tendency to choose the answers that would present them in a favourable way). Further research should focus on other questions which better define Nurturance.

By rigorously reducing items in a questionnaire, care should be taken not to diminish the face-validity of the test. This study did not aim to make a new CRPR version. However it

suggests that more research should be done to assess whether the CRPR can be improved and to see if we can reproduce the results and whether their clinical validity can be assessed.

This improvement might be valuable as the CRPR has a proven track record. It has been used to examine the stability of parental child-rearing attitudes across time [Roberts et al., 1984; McNally et al., 1991]. The CRPR also has been used to examine several issues: the relationship between parent-reported child-rearing practices during early childhood and adolescent self-esteem, their intelligence, their aspects of moral judgment, ego-control and resiliency [Vaughn et al., 1988]; adolescent drug use [Block et al., 1988] and adolescent satisfaction in ice hockey [Juntumaa et al., 2005]. It has also been used cross-sectionally to examine child-rearing attitudes in physically abusive families [Susman et al., 1985; Tricket & Susman, 1988]; families with depressed parents [Susman et al., 1985; Stoneman et al., 1989]; and families with children who have cancer [Davies et al., 1991], Sickle Cell Disease [Noll et al., 1998], Juvenile Rheumatoid Arthritis [Gerhardt et al., 2003], clinical anxiety disorders in childhood [Lindhout et al., 2009] and developmental disabilities [Woolfson & Grant, 2006]. In addition, considerable coherence had been found between self-report descriptions provided by mothers and observed parenting behaviours recorded independently [Block, 1980].

To summarize, factor analyses on the sub selection of items resulted in two factors with good explained variance. These factors can only be used when they have good clinical usefulness, e.g. the items together are related to either the way parents anticipate or deal with the child's dental anxiety or the way the child deals with an aversive situation. The factor Nurturance consists of items that all deal with love, tenderness and respectful interaction with children. The items of the factor Restrictiveness are more difficult to interpret. They all are very negative rearing attitudes about what children should do and are not allowed to do.

The results of this study suggest that the CRPR can be used in a shorter version. This version may be less time consuming to administer and thereby more easy to use in the (second line) dental practice. However more research should be done to investigate the reproducibility of our results in other samples and its usefulness in the dental clinic.

Additional comments by the authors

In the present study, a 2-factor structure was found underlying the 40 CRPR items. We tried to replicate these results on the data collected in chapter 6, but were unable to confirm the factor structure. This implies that this 2-factor structure is not stable across samples. Given the fact that the data for chapter 6 was already collected before the factor analysis described in chapter 2 was performed, we simply used the original questionnaire and the original factors, Nurturance and Restrictiveness, as described by Rickel and Biasatti [1982] for any subsequent analysis.

Part one

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3

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Part one