Inter-rater agreement between children's self-reported and parents' proxy-reported dental anxiety

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IN BRIEF

- Encourages clinicians to conduct formal assessment of children's dental anxiety using validated questionnaires in line with SDCEP guidelines' recommendations.
- Raises a question on parents'/guardians' judgment of their child's dental anxiety and encourages children's self-reported dental anxiety assessments.
- Describes children's self-reported dental anxiety to be present in 18% of study participants.

RESEARCH

Background Healthcare professionals often rely on parents to provide accurate dental anxiety assessment for their children. To date no studies have reported on inter-rater agreement between children's self-reported and their parents'/guardians' proxy-reported dental anxiety in the UK. **Aims** To assess the frequency of self-reported dental anxiety in 7–16-year-old children and the inter-rater agreement between children's self-reported and parent/guardian proxy-reported dental anxiety for their children. **Methods** Data were collected prospectively from 7–16-year-old children and their parents/guardians attending two community dental clinics in Fife, Scotland (July 2012–January 2013). Dental anxiety was assessed using faces version of Modified Child Dental Anxiety Scale. Questionnaires were separately and independently completed by children and their accompanying parent or guardian. **Results** One hundred and thirty-two child-parent/guardian pairs participated in this study. Children's self-reported dental anxiety was 18% (n = 24, 95% CI 12–25). Inter-rater agreement between children and their parent/guardian was poor for dental filling (linear weighted kappa coefficient 0.17) and tooth extraction (0.20), whereas other questions had fair inter-rater agreement (0.21–0.34). Parents' proxy-reported assessments significantly failed to recognise dental anxiety in 46% (n = 11) dentally anxious children (p = 0.0004). **Conclusion** Parent/guardian proxy-reported dental anxiety differs from children's self-reported dental anxiety suggesting children should be encouraged to self-report their dental anxiety.

INTRODUCTION

Dental anxiety and phobia are known barriers to receiving regular dental care in many anxious patients.[1] Dental anxiety in paediatric patients can not only lead to disruptive behaviour during treatment but may manifest as dental avoidance in adult life and may lead to poor oral health outcomes.[2] Around 50% of adult patients with dental anxiety report childhood onset of their anxiety and most could relate this to negative experiences during dental treatment.[3] Hence, identifying dentally anxious children early in life will facilitate better patient management and may help reduce poor oral health outcomes in these patients as adults.

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The Scottish Dental Clinical Effectiveness Programme (SDCEP) has produced Oral Health Assessment and Review (OHAR) guidelines. These guidelines recommend the use of dental anxiety questionnaires in anxious patients to help alleviate their anxieties. They have proposed the use of Modified Child Dental Anxiety Scale faces (MCDASf) version without the last two questions (on dental sedation and general anaesthesia) for all anxious children.[4] Questionnaire-based assessment of dental anxiety is the most commonly used method of dental anxiety assessment in paediatric patients.[5] However, studies have reported variable respondents for children such as their parents, clinicians or children themselves.[6] Children as young as five are considered to be able to self-report their anxieties using questionnaires,[5,7] but healthcare professionals often rely on parents to provide accurate information regarding their child's dental anxiety.[8] However, parents' dental anxiety can influence judgement of their child's dental anxiety and may result in overestimation or underestimation of their child's anxiety state.[9] Hence, this study assessed both children's self-reported dental anxiety and parents' proxy-reported dental anxiety for their children using the SDCEP-OHAR recommended MCDASf questionnaire in 7–16-year-old children and their accompanying parent. The aims of this study were to assess the frequency of dental anxiety in 7–16-year-old children and to compare parents' assessment of child's dental anxiety with children's self-reported dental anxiety using MCDASf-OHAR questionnaire.

METHODS

Study population and data collection

The study population was drawn from two clinics within salaried primary care dental service in Fife, Scotland (St Andrews community dental clinic and Glenwood dental centre). These centres provide routine dental care as well as referral service for dentally anxious adults and children. This study was a prospective questionnaire-based dental anxiety survey involving registered and referred children aged 7–16 years and their parents/guardians attending the clinics between 1 July 2012 and 1 January 2013.

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A consecutive 132 child-parent/guardian pairs were approached and all agreed to participate. Consecutive sampling was used to reduce selection bias and to keep the study as close to clinical setting as possible. The accompanying parent/guardian received a cover and consent letter. Only the parent/guardian accompanying the child on the day of the appointment was invited to participate in the study. No questionnaires were sent home for the other parent.

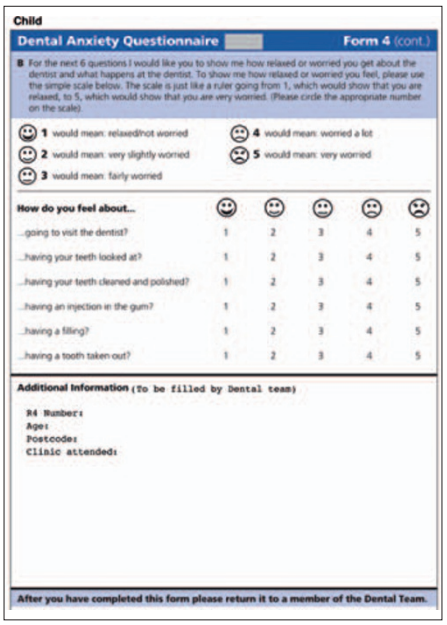
All child-parent pairs were asked to complete the questionnaires in the dental surgery at the start of the dental appointment before examination or treatment. These questionnaires were completed separately and independently by children and parents under the direct supervision of the dental team. They were assisted by the dental team only on request to reduce operator influence. Demographic details collected included age of the child, attending with mother/father/guardian, Scottish Index of Multiple Deprivation (SIMD) score and patient type (registered or referred).

Children were required to answer the questionnaires themselves, therefore those with learning disabilities and language difficulties were excluded from the study. The study participants were limited to those attending the dental clinic of the single participating dentist. The dental anxiety measure used in this study is based on the MCDASf which has been tested for reliability and validity in 8–12-year-old children in 2007.[7] The authors suggest that this faces version could be easily used in a wide age group of children, including as young as five years old. However, younger children had to be assisted in filling the questionnaire.[7] Therefore children younger than seven years were excluded from the study to reduce the likelihood of operator influence.

The project did not require ethical review under the terms of Governance Arrangement for Research Ethics Committees (GAfREC Ref: CYA/AG/12/GA/060) based on review of project protocol by the East of Scotland Research Ethics Service.

Dental anxiety assessment questionnaire

The SDCEP has produced OHAR guidelines. The dental anxiety measure for children recommended in these guidelines is based on the MCDASf, which has been tested for reliability and validity in 8–12-year-old children.[4] It consists of six questions without the last two questions in the original MCDASf which were 'exploring anxiety related to dental general anaesthesia and sedation' (Fig. 1, 2). This is due to the fact that children could be unaware of sedation and general anaesthesia experience and may find it difficult to score these questions.[5] This study uses the SDCEP recommended shortened MCDASf questionnaire, referred as MCDASf-OHAR.


Child

Dental Anxiety Questionnaire Form 4 (cont.)

8 For the next 6 questions I would like you to show me how relaxed or worried you get about the dentist and what happens at the dentist. To show me how relaxed or worried you feel, please use the simple scale below. The scale is just like a ruler going from 1, which would show that you are relaxed, to 5, which would show that you are very worried. (Please circle the appropriate number on the scale).

1 would mean: relaxed/not worried
2 would mean: very slightly worried
3 would mean: fairly worried
4 would mean: worried a lot
5 would mean: very worried

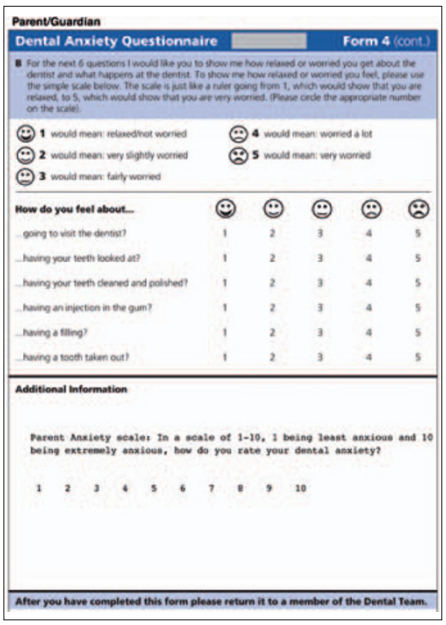
How do you feel about...	1	2	3	4	5
...going to visit the dentist?	1	2	3	4	5
...having your teeth looked at?	1	2	3	4	5
...having your teeth cleaned and polished?	1	2	3	4	5
...having an injection in the gum?	1	2	3	4	5
...having a filling?	1	2	3	4	5
...having a tooth taken out?	1	2	3	4	5

Additional Information (To be filled by Dental team)

R4 Number:
Age:
Postcode:
Clinic attended:

After you have completed this form please return it to a member of the Dental Team.

Fig. 1 MCDASf-OHAR child dental anxiety questionnaire


Parent/Guardian

Dental Anxiety Questionnaire Form 4 (cont.)

8 For the next 6 questions I would like you to show me how relaxed or worried you get about the dentist and what happens at the dentist. To show me how relaxed or worried you feel, please use the simple scale below. The scale is just like a ruler going from 1, which would show that you are relaxed, to 5, which would show that you are very worried. (Please circle the appropriate number on the scale).

1 would mean: relaxed/not worried
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How do you feel about...	1	2	3	4	5
...going to visit the dentist?	1	2	3	4	5
...having your teeth looked at?	1	2	3	4	5
...having your teeth cleaned and polished?	1	2	3	4	5
...having an injection in the gum?	1	2	3	4	5
...having a filling?	1	2	3	4	5
...having a tooth taken out?	1	2	3	4	5

Additional Information

Parent Anxiety scale: In a scale of 1-10, 1 being least anxious and 10 being extremely anxious, how do you rate your dental anxiety?

1 2 3 4 5 6 7 8 9 10

After you have completed this form please return it to a member of the Dental Team.

Fig. 2 MCDASf-OHAR parent proxy dental anxiety questionnaire

Each question has five faces ranging from a very happy face to a very sad face and score range of one to five. The total score range of MCDASf-OHAR was 6–30. Children with a score ≥19 were considered to have dental anxiety as per the OHAR guidelines development group recommendation.[7] The same questionnaire was used for both children's self-reported and parents' proxy-reported dental anxiety for accuracy of comparison. To make sure parents filled the questionnaires on behalf of their child, in the questionnaires administered to all parents the text of the question '*how do you feel*' was changed to '*how does your child feel*'. This was followed by clear verbal instructions that they were filling the questionnaire for their children.

The questionnaire completed by parents/guardians included an additional question on their own dental anxiety based on a non-validated 10-point Likert scale (Fig. 2). Parents who scored ≥7 (top tertile) were considered to be dentally anxious as other validated dental anxiety scales, such as Corah's dental anxiety scale or Modified dental anxiety scale, also used the top-tertile as the cut-off for dental anxiety.[10]

Statistical analysis

The data were analysed using Stata 13.0. It was hypothesised that there was no difference between parent-reported and child's self-reported dental anxiety assessment. Inter-rater agreement on individual question scores was analysed using percentage agreement and linear weighted kappa (k) coefficient with 95% confidence interval.[11] k-coefficient accounts for inter-rater agreement expected by chance and linear weighted k-coefficient was used as this determines perfect inter-rater agreement as well as calculates degree of disagreement between the raters - that is how far the scores differed when they did not match. It is the recommended method for assessing inter-rater agreement in ordinal data.[12] The interpretation of k-coefficient is as follows: < 0.20 = poor agreement, 0.21–0.40 = fair agreement, 0.41–0.60 = moderate agreement, 0.61–0.80 = substantial agreement, 0.81–1.00 = almost perfect agreement and 1.00 = perfect agreement.[12]

RESULTS

Total 132 child-parent/guardian pairs were approached and all agreed to participate in this study (n = 132). About one-fifth (n = 24, 18%, 95% CI 12–25) of children self-reported dental anxiety (Table 1). The median age of children participating in this study was 9.7 years (IQR 8–11.8) and the mean (SD) was 10 (± 2.4) years. The study population consisted of a larger proportion of 7–11-year-old children (n = 102, 77%) compared to 12–16-year-old (n = 30, 23%). Self-reported dental anxiety was double in 12–16-year-old children (nine out of 30, 30%, 95% CI 14–50) compared to 7–11-year-old children (15 out of 102, 15%, 95% CI 8–23), however this difference was statistically non-significant (p = 0.064). Children were almost equally distributed between genders, males 67 (51%) and females 65 (49%). Female children were slightly more anxious (13 out of 65, 20%) than males (11 out of 67, 16%), again this

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Table 1 Comparison of dentally anxious and non-anxious children. *Unweighted kappa-coefficient (95% CI)

n=132	Total	Non-anxious group (MCDASf< 19)	Dentally anxious group (MCDASf ≥ 19)	p-value
n (%, 95% CI)	132	108 (82%, 74–87)	24 (18%,12–25)	
Age Median (IQR)	9.7 (8–11.8)	9.8 (8–11.3)	9.75 (7.3–13.9)	0.79
Age categories				0.064
7–11 years n (%)	102 (77%)	87 (81%)	15 (63%)	
12–16 years n (%)	30 (23%)	21 (19%)	9 (37%)	
Gender				0.65
Male n (%)	67 (51%)	56 (52%)	11 (46%)	
Female n (%)	65 (49%)	52 (48%)	13 (54%)	
Social deprivation				1.0
SIMD low (1–3)- deprived n (%)	72 (55%)	59 (55%)	13 (54%)	
SIMD high (4–5)- non-deprived n (%)	60 (45%)	49 (45%)	11 (46%)	
Patient registration				0.054
Registered n (%)	112 (85%)	95 (88%)	17 (71%)	
Referred n (%)	20 (15%)	13 (12%)	7 (29%)	
Parent's own dental anxiety				0.248
Dentally non-anxious parent (Likert score < 7)	81 (61%)	69 (64%)	12 (50%)	
Dentally anxious parent (Likert score ≥ 7)	51 (39%)	39 (36%)	12 (50%)	
Children's dental anxiety based on parent-proxy report				0.0004 0.32 (0.13–0.51)*
Non-anxious group (MCDASf< 19)	100 (76%)	89 (82%)	11 (46%)	
Dentally anxious group (MCDASf ≥ 19)	32 (24%)	19 (18%)	13 (54%)	

Table 2 Children's self-reported median MCDASf-OHAR individual question scores

Individual questions of MCDASf (Scale range 1–5 per question)	Child self-reported score
	Median (IQR)
Q-1 Going to dentist	1(1,2)
Q-2 Having teeth looked at	1(1,2)
Q-3 Having teeth cleaned and polished	1 1,2)
Q-4 Having injection in the gum	3(2,4)
Q-5 Having a filling	3(1,3)
Q-6 Having a tooth taken out	4(2,5)
Total score (IQR)	13.5(11,18)

finding was statistically non-significant (p = 0.65). Self-reported dental anxiety distribution was the same between low SIMD (13 out of 72, 18%) and high SIMD (11 out of 60, 18%) groups. Most of the children in this study were registered community patients (n = 112, 85%) and 20 (15%) were referred by general dental practitioners. Referred patients were more dentally anxious (seven out of 20, 35%) than registered patients (17 out of 112, 15%), however this difference was statistically non-significant (p = 0.054).

In this study parents' own self-reported dental anxiety (n = 51, 39%) was double their children's self-reported dental anxiety (n = 24, 18%) (Table 1). Dentally anxious parents had more dentally anxious children (12 out of 51, 24%) than non-dentally-anxious parents (12 out of 81, 15%), although this finding was statistically non-significant (p = 0.248). A large proportion of proxy-reported MCDASf-OHAR was filled by mothers (n = 105, 79%), followed by fathers (n = 22, 17%) and only 4% (n = 5) by guardian or carer. Prevalence of dental anxiety in this study was slightly higher when proxy-reported by parent/guardian (n = 32, 24%) compared to when self-reported by children (n = 24, 18%). Parents were better at recognising dentally non-anxious children (89 out of 108, 82%). However, they failed to recognise dental anxiety in 46% (n = 11) dentally anxious children and this finding was statistically significant (p = 0.0004). Inter-rater agreement on presence or absence of dental anxiety between children's self-reported and parent's proxy-reported assessments showed fair agreement (Cohen's k-coefficient 0.32)

Table 2 presents children's median dental anxiety scores on individual questions of self-reported MCDASf-OHAR. The first three questions on the questionnaire, '*going to the dentist*', '*having teeth looked at*' and '*having teeth cleaned and polished*', had the least anxiety scores (median 1, (IQR1,2)). The last question '*having a tooth taken out*' generated the highest median anxiety score (4(2,5)), closely followed by the questions on '*having injection in the gum*' (3(2,4)) and '*having a filling*' (3(1,3)).

Inter-rater agreement

The inter-rater agreement between children's self-rated and parents' proxy-rated MCDASf-OHAR individual question score was calculated using linear weighted k-coefficient (Table 3). The first question '*going to the dentist*' had the highest total inter-rater agreement (n = 70, 53%), whereas question five '*having a filling*' had the least (n = 32, 24%). This was also reflected in the k-coefficient values. The weighted k values for the first four questions lay between 0.21–0.34

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(fair agreement) and for the last two questions they were 0.17–0.20 (poor agreement).

DISCUSSION

The aims of this prospective questionnaire-based study were to estimate the proportion of dentally anxious 7–16-year-old children attending two community dental clinics in Fife, Scotland and to assess the inter-rater agreement between children's self-reported dental anxiety and parents' proxy-reported child's dental anxiety using MCDASf questionnaire. It was hypothesised that there is no difference between parent-reported and child's self-reported dental anxiety. The present study is one of the very few studies to report on dental anxiety using MCDASf as the dental anxiety measure.[13] To date no studies have been reported on inter-rater agreement between children's self-reported and their parents' proxy-reported dental anxiety in the UK.

Eighteen percent of 7–16-year-old children in this study self-reported dental anxiety. Parents' proxy-reported dental anxiety was different to children's self-reported dental anxiety and the inter-rater agreement using kappa statistics showed only poor to fair agreement. Parents/guardians were better at recognising dentally non-anxious children than dentally anxious children. Most importantly, parents failed to recognise dental anxiety in 46% dentally anxious children.

Dental anxiety is not uncommon,[14,15] and the reported prevalence of dental anxiety varies according to the sample size and the measure of dental anxiety used.[2,16] There have been limited studies in Scotland into prevalence of dental anxiety in children.[16,17] In 1989, a study on 13–14 years old Scottish children reported high self-rated dental anxiety in 7% of children,[16] while the children's dental health survey of 2003 reported dental anxiety in 25% children in the UK.[17] Other large scale surveys have reported paediatric dental anxiety prevalence between 7–14%.[15] The proportion of dentally anxious children in the present study was found to be similar to most of the above studies.

Dental anxiety in children has been correlated to several factors such as young age, female gender, dentally anxious parents and low socio-economic status.[6] Some studies have reported more anxiety in younger compared to older children,[18,19] and others report no or little difference between the age groups.[20–22] Interestingly, dental anxiety was found to change through age, with some children losing dental fear at an older age and some acquiring it later in life through perhaps negative experiences and avoidance of dental treatment.[20,23] Dental anxiety in this study was double in 12–16-year-old compared to 7–11-year-old children, however this difference was statistically non-significant. The sample size for 12–16-year-old children was considerably small (n = 30, 23%) and had higher proportion of referred patients with higher dental anxiety. This study did not collect information on known predictors of dental anxiety such as previous negative dental experiences or dental trauma.[2,24]

Table 3 Measure of inter-rater agreement between child's self-reported and parent's proxy-reported dental anxiety scores

Individual questions of MCDASf-OHAR	No of agreements N = 132	Percentage agreement	Weighted kappa-kappa coefficient (95% confidence interval)
Q-1 Going to dentist	70	53%	0.34 (0.20, 0.48)
Q-2 Having teeth looked at	68	51%	0.21 (0.05, 0.37)
Q-3Having teeth cleaned and polished	64	48%	0.27 (0.12, 0.41)
Q-4 Having injection in the gum	39	30%	0.21 (0.09, 0.32)
Q-5 Having a filling	32	24%	0.17 (0.06, 0.28)
Q-6 Having a tooth taken out	37	28%	0.20 (0.09, 0.32)

In this study, girls were found to be slightly more anxious than boys, however this difference was statistically non-significant. Multiple studies have shown females to have higher self-reported anxiety than males,[16,18,20,25] although some report no difference between gender and reported anxieties.[15,22] Social deprivation based on SIMD did not predict dental anxiety in this study. Other studies have reported variable prevalence of dental anxiety in lower socio-economic groups of patients. Some large sample studies showed higher prevalence of anxiety in socially deprived children compared to non-deprived children;[16,17,26] while others reported no or insignificant difference.[22,24] However, treatment needs have been reported to be much higher in deprived groups due to higher caries rate, increased need of dental GA, irregular attendance patterns and poor cooperation.[27–29]

Parent's dental anxiety as a possible predictor of child's dental anxiety has been discussed in the literature. Some studies have found that dental anxiety of parents, especially mothers, was closely correlated to dental anxiety of children,[6,30,31] and that this correlation was stronger in younger (under 8 years) compared to older children.[6,30,32] This correlation varied with the type of dental anxiety assessment used. Interview methods and parent-reported child dental anxiety measures were found to be more closely correlated to parents' own dental anxiety,[6,15,19,30] whereas validated self-reported paediatric dental anxiety measures showed less or no correlation to parental anxiety.[24,32–34] In this study dentally anxious parents had slightly higher proportion of dentally anxious children than non-anxious parents, however this difference was statistically non-significant.

Parents' dental anxiety was double (39%) than their children's self-reported dental anxiety (18%) and may have reflected upon their assessment of their children's dental anxiety which was slightly higher (24%) compared to when self-reported (18%). Parents in this study were not able to accurately predict their child's dental anxiety and were generally better at recognising non-anxious children than dentally anxious children. More importantly, parents failed to recognise dental anxiety in 46% (n = 11) dentally anxious children.

Although the percentage agreement between parent-child pairs on presence (MCDASf-OHAR ≥19) or absence (MCDASf-OHAR <10) of dental anxiety was high (n = 102, 77%), adjusting for chance agreement using kappa statistics showed only fair agreement (unweighted k = 0.32). Inter-rater agreement on individual question scores, using linear-weighted k coefficient, showed fair agreement for the first four questions and poor agreement for last two questions. These agreement scores did not differ significantly between dentally anxious group of children and non-anxious children (data not shown). Inter-rater agreement on total score was not calculated as even if the total score was same, there could be significant differences within individual questions' assessments.

Few studies outside UK have explored the accuracy of parents' proxy-reported and child's self-reported measures of anxiety in dentistry.[9,35–38] A study in Israel involving 6–14-year-old children and their parents reported a strong correlation between parent-rating and child self-rating of dental anxiety.[35] However, Gustafsson *et al.*[9] looked at the parent-child agreement of dental anxiety measure using Children's Fear Survey Schedule Dental Subscale – in 8–19-year-old Swedish children and their parents and reported modest inter-rater agreement and that the validity of parental rating of child's fear should be questioned.[9] A study conducted

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in Finland on 11–16-year-old children and their parents, measured dental anxiety using a non-validated single item five-point Likert scale. They concluded that parents were unable to evaluate child's dental anxiety, and more importantly underestimated it in the highly anxious group.[37] Most of the studies so far report poor, fair or only moderate agreement between children and their parents, in spite of using different types of anxiety questionnaires and different statistical tools to assess inter-rater agreement.[9,37,38]

Hence, the findings of the present study were similar to most other published non-UK studies, indicating that parent/guardian proxy-reported anxiety assessment should be questioned and clinicians should use validated paediatric self-reported dental anxiety measures where possible.

Limitations

This study design only allowed the attending parent to participate. This was a small sample size study due to time restrains and single operator involvement. Parents' own dental anxiety was assessed using a non-validated questionnaire and hence the results could be an overestimation or underestimation of their true dental anxiety. This study design did not facilitate understanding on whether parents' assessment of the child's dental anxiety was more accurate or better representation of child's anxiety state than the child's own self-rated anxiety assessment. It only reported on agreement between the two evaluations.

CONCLUSION

Dental anxiety in 7–16-year-old children is not uncommon. Parents' proxy-reported dental anxiety differs from children's own self-reported dental anxiety suggesting children should be encouraged to self-report their dental anxiety where possible.

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