

# Children's dental fear in relation to dental health and parental dental fear

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## SUMMARY

**Objective.** The aim was to (1) assess the proportion of children with dental fear, to (2) compare results obtained by a single fear question to those obtained by using a set of 11 fear questions, to (3) study associations between children's dental fear and their dental health, and to (4) compare children's dental fears to those of their parents.

**Materials and methods.** A cross-sectional sample of 344 8-10-year-old schoolchildren from South Estonian primary schools participated. Children's fears were measured with the modified Dental Subscale of the Children's Fear Survey Schedule (CFSS-DS). The scale includes 11 fear items amongst which five represent less invasive (noninvasive items), another five invasive aspects of dental treatment (invasive items), and one question represents general dental fear of the child. In addition, two questions were included to assess parental dental fear. The dental health of children was examined using the International Caries Detection and Assessment System (ICDAS) criteria.

**Results.** The proportion of children with general dental fear was 6.1%. The mean score of noninvasive fears was higher among the youngest than among the oldest age group ( $p < 0.02$ ). Children whose dmft/DMFT-scores were  $> 0$  had higher fear scores than those whose dmft/DMFT-scores were  $= 0$  ( $p < 0.01$ ). A total of 16.8% and 15.7% of mothers and fathers afraid of dentistry in general. There were strong correlations between children's dental fears and maternal ( $p < 0.01$ ), and paternal ( $p < 0.01$ ) dental fear.

**Conclusions.** Children's fears were strongly associated with untreated caries and experience of dental treatment, and with parental fears.

**Key words:** child, dental anxiety, dental caries.

## INTRODUCTION

Dental fear (DF) is a normal emotional reaction to one or more specific threatening stimuli in dental situation while dental anxiety (DA) refers to a state of apprehension that something dreadful is going to happen in relation to dental treatment (1). Dental anxiety is a multidimensional entity consisting somatic, cognitive and emotional elements (2).

As the concepts of dental fear and dental anxiety are often used interchangeably within the dental literature, the terms dental fear and anxiety (DFA) is used throughout this paper when referring to strong negative feelings associated with dentistry.

DFA is relatively common among children and adults. Despite innovations in dental equipment and treatment procedures, part of the population experiences DFA that can be problematic during dental treatment (3). Several studies have demonstrated that DFA is a significant predictor of dental caries and is related to increased occurrence of caries among children and adolescents (4-6). High level of DFA has been associated with poor dental health (7), and there is a general agreement that negative experiences from dental treatment may induce DFA among children. Among adults dental anxiety is associated with poor dental health, poor oral health habits and irregular dental attendance (8, 9).

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Moreover, parental DFA has been associated with increased occurrence of caries in children (10, 11), and a strong association has been shown between parental and child DFA (12).

Different methods have been used for measuring dental fear (13-15). Despite many newer methods have been developed, we chose to use the modified Dental Subscale of Children's Fear Survey Schedule (CFSS-DS) including 11 questions, which has been validated and used repeatedly by Rantavuori et al. (11,16,17). The original CFSS-DS has 15 questions (18), divided into three groups: questions related to highly invasive procedures, others related to less invasive aspects of dental treatment, and victimization.

As there are no previous reports on DFA among Estonian children, we aimed to (1) assess the proportion of children with dental fear, to (2) compare the results obtained by a single question to those obtained by using a set of 11 fear questions, to (3) study associations between children's dental fear and their dental health, and to (4) compare children's dental fears to those of their parents.

## MATERIALS AND METHODS

### Subjects

The subjects were participants of an ongoing study, started in 2008 in Estonia. The sample (n=522) was drawn according to geographical area. The south-eastern region of Estonia was chosen because DMFT index in this region is one of the highest in Estonia. The information about the study and invitations to participate were sent to 21 schools in the selected area: one urban school from the major city of the region, four regional centre schools, four rural schools and one where kindergarten and elementary school were together. Ten schools did not respond, one refused. If a school refused or did not respond, another school from the same region with same parameters was selected. Reasons for refusal were not requested. As this study was a part of a 3-year study and in our opinion school administration did not like to participate in such a long study which definitely included additional tasks for the teachers.

While 10 schools in southeastern Estonia (Elva, Rāpina, Rõngu, Lāhte, Tõrva, Võru, Võnnu, Nõo, Melliste, Tartu) agreed to participate. Informed consent was obtained from all parents, and 485 (93%) healthy second- and third-grade schoolchildren participated in the dental examination and 344 (71%, 188 boys and 156 girls) returned the fear questionnaire described below in detail. The distribution

of children according to age and sex are presented in Table 1. The age of the youngest group ranged between 8.1 and 9.0 years (n=110), the group in the middle from 9.1 to 10.0 (n=174), and the age of the oldest varied from 10.1 to 10.9 (n=60). The mean (SD) age of the children was 9.3 (0.6) years.

### Measuring dental fear and anxiety

The DFA of children was assessed using the modified Dental Subscale of the Children's Fear Survey Schedule (11). The most important modifications were that three out of the 15 original questions (18) were omitted i.e. "fearing of someone looking at you", "having a stranger touching you" and "seeing people in white uniforms", and one new question about "fear of dental treatment causing pain" was added as described (11). The ten questions related to dental treatment were as follows: [1] fear of having to open the mouth, [2] fear of the dentist, [3] fear of professional cleaning of the teeth, [4] fear of the sound of drilling, [5] fear of being unable to breath, [6] fear of having instruments in the mouth, [7] fear of saliva suction, [8] fear of pain caused by dental treatment, [9] fear of tooth drilling and [10] fear of dental injections. The single question of the modified CFSS-DS i.e. dental fear in general, was here used to measure the level of general dental anxiety in children. The questions were divided into two groups: the first five were considered to represent more abstract type of discomfort (noninvasive fear items) while the remaining five questions were considered to represent discomfort related to operative dental treatment (invasive fear items). The respondents were asked to rate their anxiety using a 5-point Likert-scale: not anxious [1], a little anxious [2], anxious to some degree [3], quite anxious [4], and very anxious [5]. A zero was asked to be used if the respondent had no experience of the item questioned. Total scores for the modified CFSS-DS thus range from 11 to 55. Two supplementary questions related to maternal and paternal DFA were added as a single fear question has been proved to be valid and reliable in assessing dental fear of adults (19).

The questionnaire was translated from Finnish to Estonian by the first author (JO) by consulting Finnish co-authors (SH, EH), and pre-tested among a group of 8-10-year-old children for clarity. Patient reported outcome (PRO) measures were used for validation of translation.

At the first follow-up visit in 2009 each child was given a questionnaire to be filled out. The children started to fill out the questionnaires under the supervision of the accompanying teacher while waiting for their classmates to pass the dental exami-

nation. The questionnaires were then taken home to get the response of parents to parental dental fear.

### Recording dental health

Children's dental health was recorded by four calibrated examiners whose inter- and intra-examiner consistency was high with kappa-values above 0.9 (20). Visual inspection of caries lesions was assessed using the International Caries Detection and Assessment System criteria (21), and teeth with obvious caries (ICDAS score 4 or higher) were considered in this study. Dental health was expressed as the sum of decayed, missing and/or filled teeth in the primary and permanent dentitions. The number of decayed teeth (dt/DT) on one hand, and missing (mt/MT) and filled teeth (ft/FT) on the other were first analyzed separately to reflect possible associations with DFA. The indices were then combined to describe the extent of operative treatment needed and experienced in the developing mixed dentition (dmft/DMFT). No radiographs were taken. Examiners were unaware of the results of the questionnaire at the time of dental examination. After examination, a summary of the dental condition and possible treatment need was given to each child. In case of clear treatment need, the participants were advised to visit their family or school dentist and they were given referrals for that.

The results of the dental examination relevant for the current study are summarized in Table 2. To study the effects of operative dentistry on DFA, children were divided into groups as follows: children with or without untreated caries in the primary and/or permanent teeth (dt/DT>0 and dt/DT=0, respectively), those with or without past experience of fillings in either or in both dentitions (ft/FT>0 and ft/FT=0, respectively), children with or without extracted primary and/or permanent teeth (mt/MT>0 and mt/MT=0, respectively), and those with or without untreated caries, fillings and extracted teeth in either or in both dentitions (dmft/DMFT>0 and dmft/DMFT=0, respectively).

This study had a cross-sectional design and was approved by the Ethics Committee of the Tartu University (166/T-7) and by the regional school authorities.

### Statistical methods

To enable comparisons with results of the 15-item CFSS-DS-questionnaire (6) we created cut-offs for the sum scores of noninvasive, invasive and all fear items by adding one standard deviation to the means: 7.2, 11.5, and 20.0, respectively. Sum analyses

were carried out only for those questionnaires in which all fear items had been filled out. Hence 341 responses represented noninvasive, 335 invasive and 333 all eleven fear items. The single question of general dental fear was dichotomized and the cut-point was set between scores 2 and 3 so that responses below the cut-point had little or no anxiety/fear (Likert-scale scores 1-2), while those above had fair, moderate or severe anxiety/fear (Likert-scale

**Table 1.** Distribution of children according to age and sex

Age groups (years)	Boys N (%)	Girls N (%)	Total N
8.1-9.0	59 (53.6)	51 (46.4)	110
9.1-10.0	98 (56.3)	76 (43.7)	174
10.1-10.9	31 (51.7)	29 (48.3)	60
Total	188 (54.7)	156 (45.3)	344

**Table 2.** Distribution of children according to dental health

	(1) dt/DT N (%)	(2) ft/FT N (%)	(3) mt/MT N (%)	(4) dmft/DMFT N (%)
>0	183 (53.2)	303 (88.1)	10 (2.9)	320 (93.0)
=0	161 (46.8)	41 (11.9)	334 (97.1)	24 (7.0)

The symbols are: (1) children with (dt/DT>0) or without (dt/DT=0) untreated caries in the primary and/or permanent teeth, (2) children with (ft/FT>0) or without (ft/FT=0) past experience of fillings in either or in both dentitions, (3) children with (mt/MT>0) or without (mt/MT=0) extracted primary and/or permanent teeth, and (4) children with (dmft/DMFT>0) or without (dmft/DMFT=0) untreated caries, fillings and extracted teeth in the primary and/or permanent teeth.

**Table 3.** Frequencies and proportions of children with general fear, fear of specific items (Likert-scale $\geq$ 3), and means (SD) of three fear-score groups

Dental fear item	N (%)
General fear of dentistry (344)	21 (6.1)
Noninvasive items (341)	
1. Fear of having to open the mouth (335)	2 (0.6)
2. Fear of the dentist (340)	10 (2.9)
3. Fear of professional cleaning (332)	11 (3.3)
4. Fear of the sound of drilling (329)	10 (3.0)
5. Fear of not being able to breath (310)	14 (4.5)
Invasive items (335)	
6. Fear of having instruments in the mouth (340)	11 (3.2)
7. Fear of saliva suction (323)	10 (3.1)
8. Fear of pain during treatment (303)	64 (21.1)
9. Fear of tooth drilling (333)	88 (26.4)
10. Fear of dental injections (278)	106 (38.1)
Means of sums of three fear-item groups (N)	Means (SD), N (%)
Noninvasive items (341), cut-off 7.2	5.7 (1.5), 39 (11.4)
Invasive items (335), cut-off 11.5	8.2 (3.3), 49 (14.6)
Eleven fear items (333), cut-off 20.0	15.4 (4.6), 55 (16.5)

**Table 4.** Mean ranks of children’s single fear scores according to children’s dichotomized general fear of dentistry

Dental fear item	Likert≤2 (N=322) Mean rank	Likert≥3 (N=21) Mean rank	p*
Having to open the mouth	165.7	211.2	0.000
The dentist	166.6	229.5	0.000
Professional cleaning	161.6	246.8	0.000
The sound of drilling	163.0	195.4	0.022
Not being able to breath	154.5	173.2	NS
Having instruments in the mouth	168.0	208.1	0.015
Saliva suction	160.9	195.3	0.004
Pain during treatment	145.0	257.4	0.000
Tooth drilling	160.9	257.4	0.000
Dental injections	135.8	184.5	0.006

**Table 5.** Mean ranks of children’s fear-score groups according to dichotomized dental health. For explanation of symbols please refer to the legend of Table 2

	dt/DT=0 N=161 Mean rank	dt/DT>0 N=183 Mean rank	p*
Noninvasive items	163.3	177.8	NS
Invasive items	159.8	175.1	NS
All 11 items	156.7	176.0	.067
	ft/FT=0 (N=41) Mean rank	ft/FT>0 (N=303) Mean rank	p*
Noninvasive items	156.6	172.9	NS
Invasive items	139.3	171.8	.047
All 11 items	143.2	170.1	NS
	mt/MT=0 (N=334) Mean rank	mt/MT>0 (N=10) Mean rank	p*
Noninvasive items	171.4	155.1	NS
Invasive items	166.6	214.9	NS
All 11 items	166.2	195.0	NS
	dmft/DMFT=0 (N=24) Mean rank	dmft/DMFT>0 (N=320) Mean rank	p*
Noninvasive items	133.6	173.8	.036
Invasive items	106.3	172.3	.002
All 11 items	107.6	171.2	.003

\*Mann-Whitney U test; \*\*NS=not significant

**Table 6.** Statistically significant correlations between children’s general fear of dentistry (CDF), children’s invasive (CIF) and noninvasive (CNIF) fear items, maternal (MDF), and paternal dental fear (PDF)

	CDF	CIF	MDF
Fear of invasive items (CIF)	.52**		
Fear of noninvasive items (CNIF)	.37**	.59**	
Mother’s fear of dentistry (MDF)	.16**	.13*	
Father’s fear of dentistry (PDF)	.16**	.19**	.27**

The values are Pearson’s correlation coefficients: \*\*Correlation is significant at the 0.01 level, \*Correlation is significant at the 0.05 level.

scores 3-5). Arithmetical sums of non-invasive, invasive and all eleven fear items were tallied separately.

The data were analyzed using SPSS 18.0. The nonparametric Mann-Whitney U test was used to analyze differences of fear scores between age groups, sex, dental health, and between children dichotomized according to general dental anxiety. Pearson’s correlation was used to compare associations between fears of children and parents, and children’s dental health. All tests were two-sided and p-values less than 0.05 were considered significant.

**RESULTS**

The proportion of children with untreated caries (dt/DT>0) was 53.2% (Table 2). Accordingly, the majority (88.1%) of children had experience of operative treatment (ft/FT>0), and only 7.0% had no caries and no experience of operative dentistry (dmft/DMFT=0, Table 2).

Children’s general fear of dentistry assessed by one question was 6.1%. The proportions of children with single noninvasive fears varied from 0.6% to 4.5%, while those with single invasive fears ranged between 3.1% and 38.1% (Table 3). Tooth drilling (26.4%) and dental injections (38.1%) were the most feared single items. The means (SD) of noninvasive, invasive and all fear items were 5.7 (1.5), 8.2 (3.3) and 15.4 (4.6), respectively. Proportions of children exceeding the cut-off values were 11.4% for noninvasive fear items, 14.6% for invasive fear items, and 16.5% for all fear items (Table 3).

The single fear items were analyzed against the child’s dichotomized general fear of dentistry and though the number of children with general dental fear was small (n=21), the differences of all but one fear item were highly significant between the two groups of children (Table 4).

Girls were more afraid of invasive procedures and all fear items

than boys ( $p < 0.04$  and  $p < 0.03$ , respectively), and the mean ranks of noninvasive fears were higher among the youngest than among the oldest age group ( $p < 0.02$ ).

Mean ranks of noninvasive, invasive and all fear items of children with no untreated caries and with no experience of dental treatment ( $dmft/DMFT=0$ ) were significantly lower ( $p < 0.04$ ,  $p < 0.003$  and  $p < 0.004$ , respectively) than those of children with untreated caries or with past experience of operative dental treatment ( $dmft/DMFT > 0$ , Table 5).

The prevalence of maternal and paternal dental fear assessed by one question was 16.8% and 15.7%, respectively. The child's general fear of dentistry correlated with his/her own fears of non-invasive and invasive items ( $p < 0.001$  for both), and with maternal ( $p < 0.01$ ) and paternal ( $p < 0.01$ ) dental fear (Table 6). Fathers' fear of dentistry correlated significantly with that of the mothers' ( $p < 0.01$ ) as shown in Table 6.

## DISCUSSION

This is the first study to report the level of dental fear among healthy 8-10-year-old schoolchildren and their parents in Estonia. Using one single fear question we found that 6% of the children experienced fair, moderate or severe general dental fear, which is in accordance with the findings of Rantavuori et al. for 9-year-old Finnish children (11). The prevalence of dental fear for 3-18-year-old children is 9% on the average, and ranges between 5% and 20% (1). Our current findings showing that 16.5% of the children exceeded the cut-off value well fits between the range limits cited above. Our results are also in line with those of ten Berge et al. (6) who showed that using the 15-item CFSS-DS-questionnaire, 14% of a random sample of healthy 4-11-year-old Dutch children exceed their cut-off value of 32. In addition, our mean score for the 11 fear items was almost exactly the same as the mean of 11 fear items reported for Finnish 9-year-olds (11). It seems that if asked about fear of dentistry in general, children do not remember the procedures related to dental treatment in detail. We therefore think that among children a single fear question probably underestimates the "true" prevalence of DFA contrary to the case among adults (19). As expected, the proportions of children, afraid of invasive procedures, were much higher than those reporting fear of noninvasive items. The most fear-inducing items during dental treatment were drilling and injections as has been reported also earlier (11, 22).

In accordance with earlier results (6, 11, 22) we found girls to be more fearful than boys. It has been suggested that girls and younger children express

their feelings and admit their fears more freely than boys due to cultural factors or associated stigmas (23). It has been shown that fear of various dental procedures decreases with increasing age (6). In line with these reports we found that the number of children reporting fear of noninvasive items was higher among younger than among older children. According to Le Baron & Zeltzer (24), children may learn to control the way they express their fear as they grow older. In our earlier study on 9-year-old Finnish children, we found that recurrent experience of ear infections and operative dental treatment in early childhood was associated with dental fear at 9 years of age (25).

Dental fear is likely to be a significant predictor of dental caries and may be a risk factor for the incidence of dental caries (4-6). In line with earlier studies (11, 26) we found strong associations between invasive, noninvasive and all fear items and past caries experience.

Our current study also showed a clear correlation between dental fear of parents and children. Children filled out the questionnaire independently and asked for parental help only regarding questions about parental fear. This limited parental influence in our current results. It is known that parents are less likely to label boys as fearful in comparison with girls (6). In addition, parental concept of the child's dental fear may be either over- or underestimated (27). Fearful parents more often than non-fearful parents assess their child to be fearful regardless of the child's actual fears, and fearful children do not really know the dental fear of their parents (28). According to Tickle et al. (29) children whose parents are anxious, are more likely to report anxiety. Further, Themessl-Huber et al. (12) in their review about dental fear showed that irrespective of measures used, most studies find a significant relationship between dental fear of parents and children. If the evaluation is restricted to studies using established anxiety scales, just over half report a significant link between parents and children (12).

Interestingly, dental fear correlated significantly among parents. It seems that health habits and health behavior are shared between family members. Poor toothbrushing habits are associated with dental anxiety of young adults (30) and children seem to pick up the dental health habits and behavior patterns of their parents (31).

About 10% of Finnish adults have severe dental fear when measured with a single 3-step fear scale (30), while the proportion of Estonian adults with dental fear was clearly bigger as shown in the results. The larger proportion in our study was probably due to the different cut-point used for our 5-step scale. The finding of the Finnish adults refers strictly to

severe fear (30), while our results include parents with fair, moderate and severe fear.

## CONCLUSION

We can conclude that contrary to parental fears, one single question finds only about one third of all 8-10-year-old children with fair, moderate or severe dental fear.

Children's fears were strongly associated with own experiences of operative dentistry, and with parental fears.

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