Effect of Child and Parent Characteristics on Child Dental Fear Ratings: Analysis of Short and Full Versions of the Children's Fear Survey Schedule-Dental Subscale

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Abstract

Background: Child dental fear is one of the behavior problems that dentists face in practice and has been linked to poor dental health. The main objectives of this study were to compare child and parental ratings of child dental fear and to assess the effect of child and parent characteristics on the ratings.

Methods: The full version and the 6-item short version of the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) were used to assess child dental fear. The questionnaire was completed by 300 child–parent pairs recruited consecutively from a large university dental center.

Results: We found that parents generally overestimated their children's fear. However, they underestimated fear for children with high fear scores in contrast to those with low fear scores. Parental ratings were significantly affected by the child's age, gender, type of dental visit, and parental education in both the CFSS-DS versions. The difference between child and parent ratings was significantly larger for fathers and parents with higher educational achievement in the short version.

Conclusion: Administering the parent-rated CFSS-DS does not seem to be a good indicator of child dental fear. To better identify fearful children, dentists can interview young children and ask older children to complete the questionnaire. In addition, the shorter version will be useful in clinical settings because it takes less time to complete and includes only the items most closely related to dental treatment.

Key Words: Child dental fear, Anxiety, CFSS-DS, Child-parent rating

Abbreviations: CFSS-DS: The Children's Fear Survey Schedule-Dental Subscale, FSc: total fear score by child, FSp: Child total fear score by parent, HFC: High fear child, LFC: Low fear child

Introduction

Child dental fear is a behavior problem that dentists may face in their practice. It has been reported that 27% of children with behavior management problems are fearful of dental procedures [1]. Fearful children were reported to have more caries compared to children without fear [2]. A variety of different methods have been used to assess dental fear among children, including observational methods and self-reported scales [3]. The Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) is the most commonly used fear assessment tool for children [3,4].

The CFSS-DS has shown high reliability (internal consistency and test–retest reliability) and acceptable validity in English [5] and several other languages [6-14]. The questionnaire is composed of 15 items related to different aspects of dental treatment, such as dentists, injections, drilling, and opening the mouth. Each item is rated by the respondent on a 5-point Likert scale [5]. The dental subscale also contains some items not directly related to dental practice, such as being looked at or touched by a stranger and going to the hospital [3]. A modified version of the CFSS-DS with eight items has been used in some studies [15-18]. Recently, a 6-item short version, derived from the original scale through the elimination of irrelevant items, was validated [19].

In some studies, parents were invited to rate their children's dental fear [1,7,9,13,19,20], while children self-reported their own fear in other [11,12,14,17,21]. There is some controversy about the accuracy of parental ratings of child fear; agreement between child and parent ratings of dental fear ranged from good (children aged 8–13 years) [22] to weak (children aged 8–19 years) [23] and poor (children aged 11–16 years) [24]. Parents' dental fears may play a role in the assessment of their children's dental fear, but it cannot entirely explain the moderate agreement between child and parent ratings [25].

Due to these disparate results, further research is needed to investigate the effect of parent and child characteristics on dental fear reporting. In addition, it is possible that the presence of the indirectly related items in the full version of the CFSS-DS may have an effect on the agreement between children's and parents' ratings of dental fear. A third issue requiring further investigation is the effectiveness of the short 6-item version in explaining the relationship between parent and child dental fear ratings.

The aims of this study were to compare self- and parent-reported child dental fear on the full and short versions of the CFSS-DS; assess the effect of child and parent characteristics on self-reported child dental fear, parent-reported child dental fear, and the differences between the full and short versions of the CFSS-DS; and assess the ability of parents to identify children with high and low dental fears.

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Materials and Methods

Sample size

The sample size for this study was determined using a two-tailed Wilcoxon signed-rank test to compare self and parent ratings on the CFSS-DS with a small to medium effect size of 0.35, as calculated from the results of a previous study [25], an alpha error of 0.01, and a power of 0.90. These measures yielded a minimum required sample size of approximately 131 child and parent pairs. A sample of at least 285 children/parents pairs was required to allow for comparison of the mean dental fear in children based on child and parent characteristics with a medium effect size and using the same power and alpha [26]. To allow for incomplete questionnaires and other unforeseen problems, the sample was increased to 300 child and parent pairs.

Participants

A total of 300 children and their parents consecutively visiting the dental hospital of King Abdul-Aziz University, Faculty of Dentistry, Jeddah, Saudi Arabia over a period of eight months (Oct 2012–April 2013) were recruited for this study. Inclusion criteria at enrolment included child age of 6–12 years, good health, no mental or communication disorders, accompanied by a parent, willing to provide informed consent, and a native Arabic speaker (both parent and child).

Questionnaires

Child dental fear was determined by the Arabic version of the CFSS-DS; this questionnaire consists of 15 questions related to dental treatment. The answer for each item ranges from 1 (not afraid at all) to 5 (very afraid). The total fear score is between 15 and 75. We found high internal consistency (alpha=0.86) and test retest reliability (intra-class correlation=0.86, $P<0.001$). Acceptable construct and criterion validity was established by significant correlations (Spearman's rho) between total fear scores and both willingness to return to the dentist ($r=0.50$, $P<0.001$) and the Frankl Behavior Rating Scale ($r=-0.54$, $P<0.001$) [27].

Procedure

Participation was fully voluntary for both children and parents. The purpose of the study was presented to the parents to obtain their written informed consent, and verbal approval was obtained from the child. The 15-item questionnaire was administered by a team of three trained dentists to child–parent pairs individually before dental treatment. Parents were not allowed to communicate with their child while they responded to the questionnaire.

Participants who were unable to read were assisted by the research team and attempts were made to not influence their responses. In addition, socio-demographic data (age, gender, and parent education level) were collected. Ethical approval was obtained from the Research Ethics Committee, Faculty of Dentistry, King Abdulaziz University.

Statistical analysis

The questionnaires of the child and parent pairs were used to compare child- and parent-ratings of child dental fear for the full 15-item version and the 6 items comprising the short version. The Shapiro-Wilk test for normality indicated that self- and parent-reported CFSS-DS scores were not normally distributed ($P< 0.001$). Therefore, non-parametric tests were used in the analyses. Descriptive statistics including mean, Standard Deviation (SD), median, and Inter-Quartile Ranges (IQR) were calculated. The Wilcoxon signed-rank test was used to compare CFSS-DS item and total scores between children and their parents. The agreement between the total CFSS-DS score of the child and his/her parent was examined using Spearman's correlations. To assess the relationship between child and parent characteristics and total self-reported Fear Score (FSc), Parent-reported Fear Score (FSp), and any differences (FSc-FSp), the Mann-Whitney and Kruskal-Wallis tests were used. If the Kruskal-Wallis test was significant, Tukey's post-hoc test was used to assess which items were significantly different.

Children were categorized as high or low fear (HFC and LFC, respectively) using a standard cut-off score of 32 for the full CFSS-DS [25,28]. Using the same cut-off point, children whose parents gave a score of 32 or higher on the CFSS-DS were categorized as "high-fear children by parents." The sensitivity, specificity, and positive and negative predictive values were calculated to assess the usefulness of the parent-reported cut-off of 32 to categorize children. Statistical analysis was performed using STATA version 13 (Stata Corp, College Station, Texas, USA). The significance level was set at 0.05.

Results

The characteristics of the 300 child–parent pairs included in the study are displayed in *Table 1*. There were 154 (51%) girls and 146 (49%) boys with a mean age of 8.63 (SD=1.8) years, and 182 (61%) mothers and 118 (39%) fathers with a mean age of 39.16 (SD=7.4) years. The percentage of parents with less than a secondary education was 24%, with a secondary education was 33%, and with university or higher education was 43%.

Table 1. *Characteristics of children and their parents.*

Characteristic	N	(%)
Child		
Age (years)		
6-7	91	30
8-9	102	34
10-12	107	36
Gender		
Male	146	49
Female	154	51
Visit		
First visit	80	27
Not first visit	220	73
Parent		
Age (years)		
24-34	80	27
35-45	172	57
>45	48	16
Relation to child		
Mother	182	61
Father	118	39
Education		
Less than secondary	71	24
Secondary	99	33
University	130	43

Item-specific fear scores

Table 2 shows the mean, standard deviation, and median for each fear score item rated by children and parents and the total CFSS-DS scores. The three most feared items reported by the children were injections, having a stranger touch them, and the dentist drilling; parents reported the top three items most feared by their children were injections, the dentist drilling, and the noise of drilling. Parents gave higher scores for all the items except for being touched by a stranger. The differences between child and parent scores were statistically significant for all the items ($P<0.05$) directly related to dental treatment (*Table 2*). Girls reported higher fear scores than boys for all items except doctors. However, the differences were only significant for dentists and being touched or looked at by a stranger ($P<0.05$).

The comparison of item-specific fear scores self-reported by children to scores reported by their parents stratified by the children's fear level is illustrated in *Figure 1*. Parents underestimated dental fear for most of the items for HFC and overestimated dental fear for LFC.

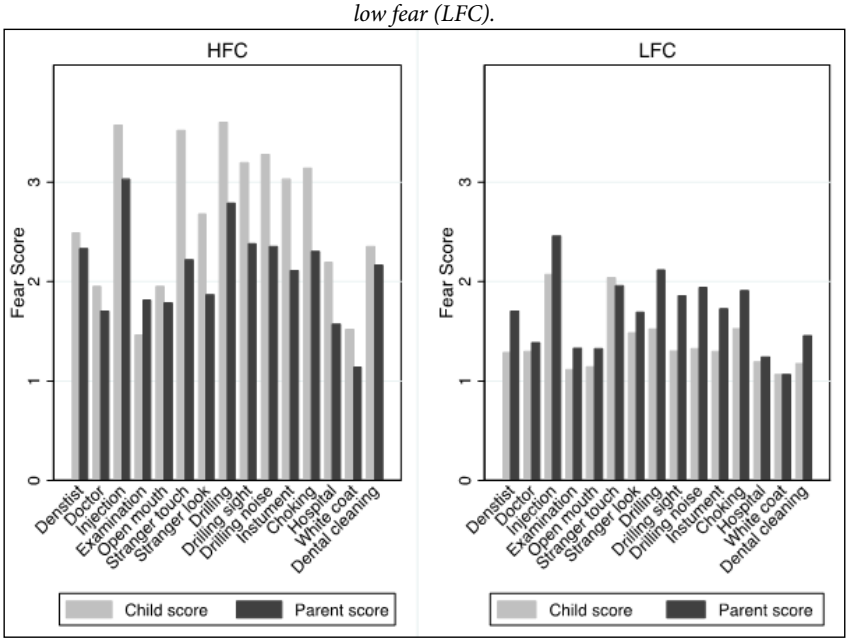
Table 2. *Comparison of self- and parent-reported child dental fear (CFSS-DS) items and total scores.*

	Self-reported		Parent-reported		*P**
	Mean (SD)	Median (IQR)	Mean (SD)	Median (IQR)	
Item					
1-Dentists#	**1.4 (0.8)**	**1 (1, 2)**	**1.8 (0.9)**	**2 (1, 2)**	**<0.001**
2-Doctors	1.4 (0.8)	1 (1, 1)	1.4 (0.7)	1 (1, 2)	0.078
3-Injections	2.3 (1.3)	2 (1, 3)	2.5 (1.2)	2 (2, 3)	<0.001
4-Having somebody examine your mouth#	**1.2 (0.5)**	**1 (1, 1)**	**1.4 (0.7)**	**1 (1, 2)**	**<0.001**
5-Having to open your mouth	1.2 (0.6)	1 (1, 1)	1.4 (0.7)	1 (1, 2)	<0.001
6-Having a stranger touch you	2.2 (1.3)	2 (1, 3)	2.0 (1.0)	2 (1, 3)	0.026
7-Having somebody look at you	1.6 (1.0)	1 (1, 2)	1.7 (1.0)	1 (1, 2)	0.056
8-The dentist drilling#	**1.8 (1.5)**	**1 (1, 2)**	**2.2 (1.1)**	**2 (1, 3)**	**<0.001**
9-The sight of the dentist drilling#	**1.5 (1.0)**	**1 (1, 2)**	**1.9 (1.0)**	**2 (1, 2)**	**<0.001**
10-The noise of the dentist drilling#	**1.6 (1.0)**	**1 (1, 2)**	**2.0 (1.0)**	**2 (1, 3)**	**<0.001**
11-Having somebody put instruments in your mouth	1.5 (1.0)	1 (1, 2)	1.8 (0.9)	2 (1, 2)	<0.001
12-Choking	1.7 (1.1)	1 (1, 2)	2.0 (1.0)	2 (1, 2)	<0.001
13-Having to go to the hospital	1.3 (0.8)	1 (1, 1)	1.3 (0.6)	1 (1, 1)	0.51
14-People in white uniforms	1.1 (0.5)	1 (1, 1)	1.1 (0.3)	1 (1, 1)	0.796
15-Having the dentist clean your teeth#	**1.3 (0.8)**	**1 (1, 1)**	**1.5 (0.8)**	**1 (1, 2)**	**<0.001**
Total score: Full Version					
All children	23.2 (8.0)	21 (17, 26)	25.9 (8.3)	24 (19, 31)	<0.001
High fear	39.9 (7.2)	39 (34, 45)	31.5 (10.3)	30 (23, 36)	<0.001
Low fear	20.8 (4.5)	20 (17, 24)	25.1 (7.7)	24 (19, 30)	<0.001
Total score: Short Version					
All children	8.8 (3.8)	7 (6, 10)	10.8 (4.3)	10 (7, 14)	<0.001

*Wilcoxon signed rank test, $P<0.05$ is statistically significant.

#The 6-item short version

Figure 1. *Comparison of self-reported and parent-reported child dental fear (CFSS-DS) item scores reported among children with high fear (HFC) and low fear (LFC).*



In the short version, all item scores reported by parents were significantly higher in comparison to their children, but the ranking of items was the same for children and their parents. Drilling was the most feared item and having someone examine your mouth was the least feared (*Table 2*).

Total child fear scores

The comparison of total CFSS-DS self- and parent-reported fear is displayed in *Table 2*. In the full version, the total CFSS-DS self-reported fear score was significantly lower ($P<0.001$) than the parent-reported fear. When the scores were stratified by fear level, LFC showed the same pattern with significantly lower child self-reported than parent-reported fear ($P<0.001$), but HFC showed the opposite pattern; self-reported fear was significantly higher than parent-reported fear ($P<0.001$). The total self-reported fear was significantly lower ($P<0.001$) than parent-reported fear on the short version.

A weak significant correlation was found between the total self-reported and parent-reported child fear scores on the short version (Spearman's rho=0.36, $P<0.001$) and on the full version (Spearman's rho=0.33, $P<0.001$). No significant correlation existed among the HFC (Spearman's rho=-0.13, $P=0.456$), while a weak significant correlation existed among the LFC (Spearman's rho=0.27, $P<0.001$).

Child and parent characteristics

Tables 3 and 4 show child and parent characteristics affecting self- and parent-reported child fear scores (FSc and FSp, respectively) and the difference between these ratings (FSc-FSp) on the full and short versions of the CFSS-DS. In both versions, the children's self-reported CFSS-DS scores were significantly affected by parental education level ($P<0.05$); children whose parents had a higher level of education reported significantly higher fear scores. However, in the full version, fear scores were also affected by gender; girls reported a significantly higher level of fear than boys did ($P<0.05$).

Parent-reported child fear, in both the full and short versions of CFSS-DS, was significantly affected by the age and gender of the child, whether the visit to the dentist was the first, and parental education ($P<0.05$). Parents reported significantly higher fear for girls than for boys, for first visits than other visits, and for ages 6–7 years compared to ages 10–12 years in the full version, and ages 8–9 years compared to ages 10–12 years in the short version. Moreover, parents with a university education or higher were significantly more likely to report high child fear scores than parents with less than secondary or secondary school education.

Examining the differences in scores (FSc-FSp), on average, parents were more likely to overestimate their child's fear regardless of the child or parent characteristics (*Tables 3 and 4*). In both CFSS-DS versions, the only significant difference

Table 3. *Association of parent and child characteristics with self- and parent-reported child dental fear scores and the differences in the full version of the CFSS-DS.*

Characteristics	Child Score	*P*	Parent Score	*P*	Difference in score†	*P*
	Median (IQR)		Median (IQR)		Median (IQR)	
Child						
Age (years)						
6–7	21 (17, 26)	0.602	26 (21, 32)	0.038§	-6 (-12, 1)	0.019¶
8–9	21 (18, 26)		24 (19, 31)		-3 (-9, 2)	
10–12	22 (18, 27)		23 (18, 30)		-1 (-5, 3)	
Gender						
Male	20 (17, 25)	0.003	22 (19, 29)	<0.001	-2 (-8, 2)	0.146
Female	22 (19, 27)		27 (21, 32)		-3 (-10, 2)	
Visit						
First visit	22 (18, 27)	0.489	27 (22, 32)	0.044	-3 (-9, 2)	0.689
Not first visit	21 (17, 26)		23 (19, 31)		-3 (-9, 2)	
Parent						
Age (years)						
24–34	21 (17, 26)	0.906	25 (21, 32)	0.318	-2 (-11, 2)	0.664
35–45	21 (17, 27)		25 (20, 31)		-3 (-9, 2)	
>45	20 (18, 27)		23 (19, 30)		-2 (-8, 3)	
Relation to child						
Father	21 (17, 27)	0.631	25 (20, 32)	0.202	-5 (-10, 2)	0.062
Mother	21 (18, 26)		24 (19, 30)		-2 (-7, 2)	
Education						
<Secondary	19 (16, 24)	0.014‡	22 (19, 27)	<0.001‖	-2 (-5, 1)	0.066
Secondary	21 (17, 26)		24 (18, 30)		-1 (-8, 4)	
University	22 (19, 28)		27 (21, 33)		-4 (-11, 2)	

†Child score – parent score

Mann-Whitney test and Kruskal-Wallis with Tukey's post-hoc test

$P<0.05$ is statistically significant

§ 6–7 > 10–12

¶ 6–7 > 10–12

‡Less than secondary < Secondary; Secondary < University

‖ Less than secondary < University; Secondary < University

Table 4. *The association of parent and child characteristics with self- and parent-reported child dental fear scores and the differences on the short version of the CFSS-DS.*

Characteristics	Child Score	P	Parent Score	P	Difference in score†	P
	Median (IQR)		Median (IQR)		Median (IQR)	
Child						
Age(years)						
6–7	7 (6, 12)	0.556	11 (8, 14)	0.039§	-2 (-6, 0)	0.113
8–9	7 (6, 9)		10 (7, 13)		-2 (-5, 0)	
10–12	7 (6, 11)		9 (6, 12)		-1 (-4, 1)	
Gender						
Male	7 (6, 10)	0.058	9 (6, 12)	0.001	-1 (-4, 0)	0.16
Female	8 (6, 11)		11 (8,14)		-2 (-5, 0)	
Visit						
First visit	8 (6, 11)	0.228	12 (8, 14)	0.038	-2 (-6, 0)	0.325
Not first visit	7 (6, 10)		10 (7, 13)		-2 (-5, 0)	
Parent						
Age(years)						
24–34	7 (6, 10)	0.943	10 (7, 13)	0.875	-1 (-5, 0)	0.93
35–45	7 (6, 11)		10 (7, 14)		-2 (-6, 1)	
>45	7 (6, 10)		10 (7, 13)		-2 (-4, 0)	
Relation to child						
Father	7 (6, 11)	0.436	11 (8, 14)	0.2	-3 (-6, 0)	0.031
Mother	7 (6, 10)		9 (7, 13)		-1 (-4, 0)	
Education						
Less than secondary	6 (6, 8)	0.022‡	6 (6, 12)	<0.001‖	-1 (-3, 0)	0.004¶
Secondary	7 (6, 10)		9 (6, 12)		0 (-3, 1)	
University	8 (6, 12)		12 (8, 14)		-3 (-6, 0)	

†Child score – parent score

Mann-Whitney test and Kruskal-Wallis with Tukey's post-hoc test

P<0.05 is statistically significant

§ 8–9 < 10–12

‡Less than secondary < Secondary; Secondary < University

¶ Less than secondary < University; Secondary < University

‖Less than secondary < University; Secondary < University

was found for the age of the child in the full version (*P*<0.05): parents were significantly more likely to overestimate fear for children aged 6–7 than for those aged 10–12 years. Significant differences were found between fathers and mothers and between parents of different educational levels (*P*<0.05) on the short version. Fathers were significantly more likely to overestimate their children's dental fear than were mothers. Parents with a university education or higher were significantly more likely to overestimate their child's fear than were parents with less than secondary or secondary education.

Child fear and parental rating

According to the self-reported fear by the children, 37 (12%) were HFC and 263 (88%) were LFC. However, based on parents' reports, 70 (23%) were categorized as high-fear children by parents and 230 (77%) as low-fear children by parents. Only 75 (25%) of parents rated their children in a different category than their child, resulting in a sensitivity of 43%, a specificity of 79%, a positive predictive value of 23%, and a negative predictive value of 91% (*Table 5*).

Discussion

Studies of child dental fear have used different scales, but the CFSS-DS is the only children's fear scale that is valid in all language versions [3], including Arabic. In the present study, the total mean CFSS-DS score for all children was within the range of the CFSS-DS scores reported by other studies [6,7,9,11-13], which suggests that levels of dental fear in the children are low [29].

We found that parents overestimated their children's total and item-specific fears. This may be explained by a lack of knowledge about the dental fears of their children [24]. Previous studies have also documented higher parent ratings of children's dental fear than those rated by children [23,25]. On the other hand, other investigators reported no statistically significant difference between parental and child reports of dental fear [22].

A significant weak correlation was found between the child and parent total fear scores on both the short and full versions of the CFSS-DS. This finding was supported by another study [23], which reported a weak to moderate correlation, while a more recent study reported a moderate correlation [25].

Significant differences on item specific scores and the rankings of the most feared items were found between children and parents. This finding is supported by a previous study that reported a significant difference in items related to actual dental treatment between parents and their children; children ranked injections followed by dentist drilling as the most feared items, while parents reported the reverse ranking

Table 5.*Cross-tabulation between the number of children with high and low child's dental fear rated by children and their parents.*

	Self-report		
Parent-report	**HFC**	**LFC**	**Total**
HFCp	16	54	70
LFCp	21	209	230
Total	37	263	300

HFC: High Fear Child reported by child
LFC: Low Fear Child reported by child
HFCp: High Fear Child reported by parent
LFCp: Low Fear Child reported by parent

[25]. However, in the short version, parents and children ranked all items similarly. Drilling was the most feared item and having someone examine your mouth was the least feared. This is supported by the study that introduced the 6-item short version [19] and suggests that this version may be a more valid and reliable measure of dental fear.

On both versions of the CFSS-DS, the age of the child significantly affected the report of child fear by parents; however, this was not the case in the child self-reports. A possible explanation is that parents expect younger children to be more fearful. This has also been found in previous studies, which found higher fear ratings for younger children by parents [1,23,30].

Fear scores in the full version showed that girls reported greater fear than boys, which is supported by previous studies [11,12,31], although other studies have reported no significant differences between boys and girls [9,13,32]. Girls in the present study reported significantly more fear than boys in items related to strangers. However, in the short version without those items, no significant differences between boys and girls were found**.** In addition, parents reported significantly higher fear for girls than boys in both versions. This finding may be attributed to the Arab cultural background of the study population; that is, boys are expected to act like men and be brave.

Parents also expected that going to the dentist for the first time would produce more fear for their children in comparison to other visits, although the children themselves did not report higher fear in the first visit. This suggests that parents' ability to identify their children's fear is poor. Other studies have found the same results [23,24].

Parental education was included as a parental characteristic because education affects knowledge, beliefs, and behavior of an individual. In Finland, 15-year old children were more likely to be afraid when their mothers' education level was secondary school or higher, while children of fathers with similar education level were less likely to be afraid [21]. Parental education in the present study played a role in the child's self-rated dental fear, parental rating, and the differences between the ratings. Higher levels of fear in self- or parent-reports were related to higher parental education in both CFSS-DS versions. In contrast, children in the US whose mothers or caregivers had no education beyond high school were more likely to be afraid [33]. These results might vary because of the social and cultural background of the study population. In Saudi Arabia, parents with higher education tend to be overprotective, while parents with lower education allow their children to play alone outdoors, which may encourage independence and increase experience with strangers. Overprotected children may be shy, timid, fearful, and have little contact with strangers [34]. This may explain why children of higher educated parents reported significantly higher fear scores. Previous studies reported that the educational level of the parents has no effect on their own dental anxiety [31]; high anxiety in parents is usually associated with overprotection [20,34], and high-anxiety parents rate the dental fear of their children as significantly higher than do parents with low anxiety [25]. This may explain why parents with higher education levels, who are overprotective, were more likely to report higher fear levels for their children and why the differences between child and parental ratings were significantly higher in the short version and had borderline significance in the full version. Moreover, in Saudi Arabia, it was noticed that parents with lower levels of education use fear of injections or visiting a doctor as a method of discipline. Removing those items, in addition to other non-dental related items, in the short version made the differences between child and parent rating more significant.

Although both mothers and fathers overestimated their children's fear, the difference in fear scores between fathers and their children were significantly higher than between mothers and their children in the CFSS-DS short version. This can be explained by the fact that mothers are closer to their children and more likely to accompany their children to dentist visits than are fathers; this was found in this study and other studies [25,35]. Thus, mothers may have more knowledge of their children's dental fears, which are the only items in the short version.

The effect of child and parent characteristics on differences in ratings of child fear was not the same on the full and short versions of the CFSS-DR. This may be attributed to the fact that some of the items included in the full version, when stratified by child and parent characteristics, showed different magnitudes and directions of effect; using a subset of these items in the short version sometimes produced different effects. This explains why characteristics like age, parent's gender, and education were significant in one version, but not the other.

Previous studies have used a cut-off score of 38 or more to distinguish low fearful from high fearful children on parent ratings [7,36,37]. In the present study, the score of 32 was used as the cut-off score based on recent studies [25,28] and a recent systematic review [4]. Parents were found to underestimate the fear of HFC and overestimate the fear of LFC. In addition, a weak significant correlation and no correlation were found between parents' ratings and LFC and HFC self-ratings, respectively. It has been reported that parents tend to rate dental fear for HFC slightly lower than the children themselves, while they rate the fear of LFC slightly higher than the children [25]. Thus, children with low fear are better recognized by their parents as less fearful than are those with high dental fear [24], which results in low sensitivity and high specificity of parents' reports of their children's dental fear. Sensitivity is the proportion of correctly recognized fearful children, while specificity is the proportion of correctly recognized non-fearful children. In the present study, the sensitivity value (43%) is similar to that

reported in other studies [24,25] (between 30% and 47%). Specificity, the ability to recognize non-fearful children was 79% in the present study, which is relatively similar to that recorded in other studies [24,25] (between 80% and 96%). From the clinical point of view, parental rating is not reliable because it may lead to failure to notice some patients who need special assistance.

Recently, the new short 6-item version was validated; The goal was to shorten the CFSS-DS without losing its clinical relevance [19]. The shorter version will be useful in clinical settings because it takes less time to complete and includes only the items most closely related to dental treatment. Further studies should be conducted to determine the appropriate low-fear vs. high-fear cut-off score for the 6-item scale. However, caution should be taken, as children who do not have previous dental experience may not understand the items related to drilling [12]. In addition, the results of this study suggest that inviting parents to complete the questionnaire on behalf of their children may not be useful.

This study has some limitations. The sample was recruited from a clinic, which might miss children whose fear is so great that it prevents them from going to the dentist. On the other hand, the clinical setting allowed both the parents and children to be supervised during the completion of the questionnaires and prevented them from communicating with one another. This would not be the case if children were asked to deliver the parent questionnaire to their parents, such as might occur in a sample recruited from schools. In this case, we would not be certain who completed the questionnaire or if the children and parents communicated with each other; furthermore, parental response rates might be low, as has been found in other studies reporting response rates of 44% and 61% [38,39]. In addition, the sample was derived from a university dental center, the largest treatment center in the area, which affects the generalization of the results.

Dental fear may develop a behavior guidance problem. Recognition of fearful children will allow dentist to give special attention to them. In addition identification of the specific fearful items for each child will help dentists in the behavior guidance during dental treatment. Further studies are needed to evaluate more parent characteristics that might affect parents' ability to identify the fears of their children. In addition, as parents tend to underestimate the fear of HFC, a cut-off score for the parental rating requires more investigation; a lower cut-off score may better identify high-fear children.

Conclusion

The agreement between self- and parent-reported children's dental fear is poor. Parents tend to generally overestimate their children's dental fear; however, categorizing children into high- and low-fear groups revealed that parents underestimate fear for children in the high fear group. Parents with higher levels of education and fathers tend to report higher dental fear levels. Higher levels of fear are also reported for young children, girls, and children on their first visit to the dentist. Parental rating does not seem to be a good indicator of child dental fear on either version of the CFSS-DS. To better identify fearful children, dentists can interview young children and ask the older children to complete the questionnaire by themselves. In addition, the shorter version will be useful in clinical settings because it takes less time to complete and includes only the items most closely related to dental treatment.

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