Dental fear in children: prevalence, etiology and risk factors

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CHAPTER 3.3

THE DENTAL SUBSCALE OF THE CHILDREN’S FEAR SURVEY SCHEDULE (CFSS-DS):
VALIDITY AND CLINICAL UTILITY¹

Abstract
The aim of this study was to report on the reliability and validity of the Dutch parent’s version of the Dental Subscale of the Children’s Fear Survey Schedule (CFSS-DS) and to study its clinical utility. Parents of 718 children between 4 and 12 years of age completed this Dutch version of the CFSS-DS on behalf of their child, before or during treatment. In addition, the dentist treating the child rated its level of dental fear during treatment on a 5-point Likert scale from 1) “not afraid at all” to 5) “very afraid”. Reliability analysis was performed and correlation coefficients between the two measures were calculated. The reliability of the scale proved to be high: Cronbach’s α was 0.93. Also, significant correlation coefficients between the CFSS-DS and the dentist’s ratings were found (r=0.58 and r=0.68 respectively, p<.01), providing support for the validity of the scale. It was concluded that the CFSS-DS can be of clinical value as a screening device while its predictive value of behaviour management problems should not be overestimated.

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Introduction

The Dental Subscale of the Children's Fear Survey Schedule (CFSS-DS) was developed to assess dental fear in children. It is a shorter, revised form of the Fear Survey Schedule for Children (FSS-FC), constructed to obtain a specific dental fear questionnaire for children (Cuthbert & Melamed, 1982; Scherer & Nakamura, 1968). The scale consists of fifteen items with a 5-point response scale, related to various aspects of dental treatment such as invasive procedures as injections and drilling, but also to more general medical aspects. This CFSS-DS has been widely used in recent studies and has been indicated to be a valuable and adequate measure of dental fear in children. In a review of self-report measurements, it was recommended over other measures (Venham Picture Test; Venham, Bengston & Cipes, 1977; Dental Anxiety Scale; Corah, 1969) with respect to information on its psychometric properties (Aartman, Van Everdingen, Hoogstraten & Schuurs, 1998). Prevalence estimates have been reported for US, Finnish, Swedish, Singaporean and Chinese populations, and cut-off scores for high dental fear have been set at scores between 38 and 42 (Alvesalo, Murtomaa, Milgrom, Honkanen, Karjalainen & Tay, 1993; Chellappah, Vignesh, Milgrom & Lo, 1990; Cuthbert & Melamed, 1982; Klingberg, 1994; Klingberg, Berggren & Norén, 1994; Milgrom, Jie, Yang & Tay, 1994; Milgrom, Mancl, King & Weinstein, 1995). Research in several countries demonstrated the scale to have good reliability. Both the internal consistency and the test-retest reliability proved satisfactory (see Aartman et al., 1998; Alvesalo et al., 1993; Klingberg, 1994). The CFSS-DS also showed acceptable validity. Significant relations (ranging from r=0.22 to r=0.87) with constructs such as behavioural ratings, a physiological measure and other fear questionnaires have been reported (see Aartman et al., 1998; Klingberg et al., 1994; Klingberg, Vannas Löfqvist & Hwang, 1995a; Melamed, Yurcheson, Fleece, Hutcherson & Hawes, 1978; Milgrom et al., 1994). It should however be noted that in some of these studies shorter, 8-item versions of the CFSS-DS were used and that the size of reported correlations often can be considered moderate or even low. In some of these studies, a parental version of the CFSS-DS has been used, which was found to adequately reflect the children’s level of dental fear (Klingberg et al., 1994; Milgrom et al., 1994).

The aim of the present study was to assess the reliability and validity of the Dutch parent’s version of the CFSS-DS (Ten Berge, Hoogstraten, Veerkamp & Prins, 1998). In addition, its predictive value as a screening instrument for dental fear and associated problems in daily practice was examined. For this purpose, the CFSS-DS was associated with another measure of child dental fear, in this case the dentist's rating of the child's dental fear during dental treatment. With respect to this clinical utility, the nature of possible discrepancies between the two measures is of importance; in order to accept the
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CFSS-DS as an adequate screening instrument and with respect to the prevention of dental fear, its negative predictive value should be high, thus correctly identifying non- or low fearful children. In addition, for the dentist treating the child the risk of underestimation of dental fear should be relatively small, to subsequently render treatment most effective. Therefore, the correlation between the two measures was studied, and possible discrepancies were examined more closely by calculating the positive and negative predictive value of the CFSS-DS (Brunette, 1996).

Material and methods

Participants

The study population consisted of 718 children (356 girls) treated by one of two dentists (n=519 and n=199) in two dental practices in the Netherlands. These practices were selected because of the large proportion of child dental patients visiting these practices and because both dentists did have several years of experience in treating children, so that individual differences were excluded as much as possible. All children were between 4 and 12 years of age; their mean age was 7.1 years (SD 2.1). A Dutch two-way translation of the CFSS-DS was made, and to enable comparisons between the different age levels, the Dutch parent’s version of the CFSS-DS was used (Ten Berge et al., 1998). The parents of all children were asked to complete the CFSS-DS on behalf of their child, during or before their child’s dental treatment.

Measures

The CFSS-DS consists of 15 items to be answered on a 5-point scale from 1) “not afraid at all” to 5) “very afraid”. Total scores thus range from 15 to 75. Parents have been found to be well able to assess their child’s level of dental fear by using the CFSS-DS (Klingberg et al., 1994; Milgrom et al., 1994). Previous research has indicated the following cut-off scores and classification of scores for Dutch children: a “non-clinical range” (scores below 32), a “borderline range” (scores between 32 and 39) and a “clinical range” (scores of 39 and higher) (Ten Berge, Veerkamp, Hoogstraten & Prins, in press). Children scoring in the “non-clinical range” generally are non- or low fearful, and are expected not to cause problems during treatment. Children scoring in the “borderline range” may either be at risk of becoming fearful or possibly already suffer from some degree of dental fear, but their behaviour may also depend on other factors such as circumstances or temperament. Children scoring in the “clinical range” are considered to be high fearful, and regular treatment is often interfered with.
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All parents were well informed on the purpose of the study and they all signed a consent form. In addition, the two dentists were asked to rate the child’s fearful behaviour during the child’s visit on a 5-point Likert scale ranging from 1) “not afraid at all” to 5) “very afraid” (Milgrom, Fiset, Melnick & Weinstein, 1988). The dentists were unaware of the parents’ CFSS-DS scores.

**Data analysis**

Reliability analysis was performed to assess the internal consistency of the CFSS-DS. Correlation coefficients were calculated between the dentist’s ratings and the total CFSS-DS scores. In addition, to assess the clinical utility of the CFSS-DS, the proportion of false-negative and false-positive results was studied. Also, to gain information on its clinical value, positive (PPV) and negative (NPV) predictive values of the CFSS-DS were calculated (Brunette, 1996). The positive predictive value (PPV=TP/(TP+FP)) indicates the proportion of children that has correctly been identified as being fearful, while the negative predictive value (NPV=TN/(FN+TN)) indicates the proportion of children correctly identified as not being fearful. In the present study, these values reflect the proportion of children rated as fearful or not by the dentists, in other words as showing their dental fear or causing behaviour management problems or not. Calculations were done using the borderline cut-off score of 32, and were repeated using the clinical cut-off score of 39.

**Results**

The mean CFSS-DS score of the study population was 24.7 (SD 9.1). Girls were found to be somewhat more fearful than boys (25.5 versus 23.9, t=2.37, p=.018), but no age effect was found (r=-0.06, p>.05). The internal consistency of the CFSS-DS was high: Cronbach’s alpha was 0.93. Between the CFSS-DS scores and the dentist’s ratings significant correlation coefficients were found for both dentists (r=0.58, n=519 and r=0.68, n=199, p=.000). Correlations between the CFSS-DS and the dentist’s rating for the different age levels separately showed a declining trend in the strength of the association, ranging from r=0.65 (p<.01, at 4 years of age) to r=0.41 (p>.05, at 11 years of age).

Table 1 shows the dichotomised scores on the CFSS-DS and the dentist’s ratings. Based on an earlier study (Ten Berge et al., in press) for the CFSS-DS scores 32 was used as cut-off point, and for the dentist’s ratings scores below 3 were defined as low fearful and ratings of 3 and higher as fearful. According to the CFSS-DS cut-off point, 17.0 % of the children suffer from some degree of dental fear (borderline range and higher) versus 10.2 % according to the dentist’s ratings. Of all children in this study, 10 % were considered as fearful by the CFSS-DS, while the dentist rated them as non-fearful. On the other hand, 3 % of all children...
were considered as non-fearful by the CFSS-DS, but as fearful by the dentist. The positive predictive value of the CFSS-DS proved to be 0.41 and its negative predictive value 0.96.

**Table 1.** Frequency distribution and percentages of dentist’s ratings in relation to CFSS-DS scores (cut-off score 32).

<table>
<thead>
<tr>
<th>CFSS-DS</th>
<th>dentist’s rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low</td>
</tr>
<tr>
<td>low</td>
<td>TN: 573 (79.8%)</td>
</tr>
<tr>
<td>high</td>
<td>FP: 72 (10.0%)</td>
</tr>
<tr>
<td>total</td>
<td>645 (90%)</td>
</tr>
</tbody>
</table>

NPV: \( \frac{TN}{FN+TN} = 0.96 \)

PPV: \( \frac{TP}{TP+FP} = 0.41 \)

In addition, Table 2 shows the frequency distribution using a cut-off score of 39 for the CFSS-DS. According to this CFSS-DS cut-off point, 7.4% of the children suffer from a high level of dental fear versus 10.2% according to the dentist. The positive predictive value is 0.57 and its negative predictive value 0.94.

**Table 2.** Frequency distribution and percentages of dentist’s ratings in relation to CFSS-DS scores (cut-off score 39).

<table>
<thead>
<tr>
<th>CFSS-DS</th>
<th>dentist’s rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low</td>
</tr>
<tr>
<td>low</td>
<td>TN: 622 (86.6%)</td>
</tr>
<tr>
<td>high</td>
<td>FP: 23 (3.2%)</td>
</tr>
<tr>
<td>total</td>
<td>645 (89.8%)</td>
</tr>
</tbody>
</table>

NPV: \( \frac{TN}{FN+TN} = 0.94 \)

PPV: \( \frac{TP}{TP+FP} = 0.57 \)

**Discussion**

The results of the present study again have demonstrated the reliability of the Dutch parent’s version of the CFSS-DS to be high. Support for the validity of the scale also was provided. A significant relation between the CFSS-DS scores and the dentist’s ratings was found, despite the fact that the dentists may have based their rating on more or other aspects than dental fear. In other words, in the dentist’s ratings, which may be mostly based on the child’s actual behaviour during treatment, also aspects such as coping abilities and
temperamental factors may have been incorporated. The actual behaviour displayed during treatment can be seen as the combined outcome of the child’s dental fear, its temperament and its ability to cope with invasive situations (see also Veerkamp, 1994). Of course, it should be noted that this behaviour also depends on the nature or invasiveness of the dental visit that was rated by the dentist. These notes may explain the fact that the correlation found between the CFSS-DS and the dentist’s behavioural rating was significant though somewhat moderate, similar to that found in a previous study (Klingberg, 1994). As indicated by Klingberg, Berggren, Carlsson & Norén (1995b), dental fear is not always revealed as uncooperativeness, and not all children displaying behaviour management problems are dentally fearful. This notion was also supported by the interesting declining trend in strength of associations between the two measures with increasing age, indicating that for younger children behaviour and dental fear are most strongly connected (LeBaron & Zeltzer, 1984; Mekarski & Richardson, 1997). This relation weakens as children grow older, possibly due to increasing coping abilities and a subsequent change in the expression of fear (Brown, O’Keeffe, Sanders & Baker, 1986; Prins, 1994; see Winer, 1982).

For the clinical utility of the CFSS-DS it is of interest to specifically consider the nature of the discrepancies between measures. That is, an overestimation of dental fear by the CFSS-DS would be preferred over an underestimation when using the CFSS-DS as a screening instrument prior to treatment. For effective dental treatment, only the latter could have a negative effect on the child, while the former may cause the dentist to be extra careful, which would influence treatment in a positive way. In the present study for ten percent of all children this overestimation was found, while for only three percent of all children dental fear was potentially underestimated. Furthermore, its high negative predictive value (0.96) implies that in case of the CFSS-DS indicating no or low fear, the likelihood of children acting out or behaving very fearful is small. Its relatively low positive predictive value (0.41), however, seems to confirm the notion that not all fearful children show their fear or display management problems, as discussed before. A substantial part of the fearful children seems to have not acted out, given that the dentist did perceive them as low or non-fearful, and for this group extra caution is needed. A difference clearly exists between dental fear and actual fearful behaviour in children, leading to important clinical implications. That is, in daily practice it is highly important to be alert on children possibly suffering some degree of dental fear but not showing their fear, or children at risk of developing fear. This group of children may seem to experience no difficulties during treatment, while they essentially may have problems accepting or coping with the situation. The development of dental fear may be prevented or stopped by providing extra attention and a proper behavioural management approach for these children, as children may thus be guided
towards a more adequate coping style. In conclusion, the clinical value of the CFSS-DS as a screening device of dental fear in daily practice is supported, while its value as a predictor of behavioural management problems should not be overrated. Even when using the clinical cut-off score of the CFSS-DS, over 40% of these high fearful children did not behave fearful in the dentist’s perception.

Beside as a screening tool in daily practice, the CFSS-DS can be used as an indicator for the need of referral to a centre for special dental care. Additional assessment of concomitant problems may however be necessary at these centres to further verify the reason for referral. Information on such problems may be helpful in further discriminating actual fear and behavioural management problems. Children may essentially have other problems such as behavioural disorders interfering with dental treatment, or on the other hand, high dental fear may be masked by a child’s general shyness or internalising coping style (Klingberg & Broberg, 1998; Ten Berge, Veerkamp, Hoogstraten & Prins, 1999). Based on this information on dental fear and on possible other problems, the proper management strategy for subgroups of children can be selected, subsequently increasing the chances of effective treatment.
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References


