Dental fear in children: prevalence, etiology and risk factors

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CHAPTER 8

THE ETIOLOGY OF CHILDHOOD DENTAL FEAR:
THE ROLE OF DENTAL AND CONDITIONING EXPERIENCES

Abstract
This study was aimed to examine the relative importance of invasive treatment experiences in the acquisition of dental fear in children. For this purpose, the complete dental history of 401 children (5-10 years) was studied. The level of dental fear in these children was assessed using the Dental Subscale of the Children’s Fear Survey Schedule (CFSS-DS). Differences in treatment variables between fearful and low fearful children were analysed, and regression analysis was performed to determine significant predictors of dental fear. A significant but weak relation with the number of extractions was found, while no relation with the number of fillings was found. The results have indicated that within the (direct) conditioning pathway, objective dental experiences seem to play a minor role in children’s fear acquisition, and it was suggested that subjective dental experiences may play a more decisive role. In addition, clinical support for the latent inhibition theory was provided.

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Introduction

In the literature on the acquisition of fear and phobia, different pathways are described. Rachman (1977) has proposed three pathways: directly through direct conditioning or indirectly via vicarious learning or modelling. Research has provided support for all pathways, although the acquisition of dental fear has most often been attributed to the first, that is direct conditioning. In several studies indications for a relation with invasive or painful dental treatment were found (e.g., Davey, 1989; De Jongh, Muris, Ter Horst & Duyx, 1995; Liddell, 1990; Locker, Liddell, Dempster & Shapiro, 1999; Locker, Shapiro & Liddell, 1996; Milgrom, Mancl, King & Weinstein, 1995). However, most of these studies have been carried out retrospectively among adult patients, thus based on subjective reports and possibly involving a bias. Studies among child patients have resulted in more inconsistent findings, depending on the method used to assess conditioning (Klingberg, Berggren, Carlsson & Norén, 1995; Liddell, 1990; Milgrom et al., 1995; Townend, Dimigen & Fung, 2000). That is, a relation with oral health and invasive treatment has been reported repeatedly, but conclusions on the relative contribution of factors vary among studies. For example, Milgrom et al. (1995) found oral health to be a highly important predictor, while others suggested that subjective dental experiences such as perceived dentists' empathy may be more important (Townend et al., 2000). In addition to Rachman's pathways, research has also provided evidence for an additional role of other factors. That is, temperamental factors such as general fearfulness or shyness have been associated with dental fear (Klingberg et al., 1995; Klingberg & Broberg, 1998; Ten Berge, Veerkamp, Hoogstraten & Prins, 1999; Williams, Murray, Lund, Harkiss & De Franco, 1985). Weiner & Sheehan (1990) proposed a two-fold classification of dentally fearful subjects into an endogenous and an exogenous group, with the former having conditioning as its etiological source and the latter a generally anxious constitution. A recent study on the age of onset of dental anxiety showed that child-onset patients may be more likely to fall into the exogenous etiological category, indicating that for children conditioning may be most important (Locker et al., 1999). This direct conditioning pathway, however, seems complex and is moderated by other mechanisms. That is, according to the latent inhibition theory an association between a conditioned stimulus (CS) and an unconditioned stimulus (UCS) is formed less likely when the CS is presented alone on several occasions before it is paired with the UCS, than when there were no CS-alone trials before conditioning (Davey, 1989; Lubow, 1973). For the dental situation, this means that a history of positive or neutral dental experiences may serve as a defence against the development of traumatic associations or experiences, and subsequently against the acquisition of high fears or phobias.
The aim of the present study was to examine the role of direct conditioning experiences in the acquisition of dental fear in children, for a large, more representative group of children. For this purpose, not only the role of potentially invasive dental procedures was studied, but also the timing of these experiences in a child's dental history. In addition, the children's emotional reactions during dental visits were taken into account to collect information on subjective dental experiences.

**Material and methods**

**Subjects**

This study was undertaken among 401 children (183 girls) treated in two dental practices in the Netherlands. All dentists had several years of experience in treating children and are working along standardised protocols, always using local anaesthetics before starting restorative treatment. All children are between 5 and 10 years of age (mean 7.3, SD 1.4), and 8.7% (n=35) come from a non-Western cultural background (Turkey, Morocco). To obtain complete dental records for all children, only children who were 4 years or younger at their first dental visit were included in the study.

**Assessment**

**Dental fear**

To assess the children's level of dental fear, the parents of the children were asked to complete the Dutch parent's version of the Dental Subscale of the Children's Fear Survey Schedule (CFSS-DS; Cuthbert & Melamed, 1982; Ten Berge, Hoogstraten, Veerkamp & Prins, 1998) on behalf of their child. The CFSS-DS is a shorter, revised version of the Fear Survey Schedule for Children (FSS-FC; Scherer & Nakamura, 1968), developed to obtain a specific dental fear questionnaire for children. The scale consists of 15 items related to several aspects of dental treatment, such as 'injections', 'drilling', 'having somebody examine your mouth', 'having the nurse clean your teeth' and 'having to open your mouth'. Each item can 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. Extensive research in several countries has indicated the CFSS-DS to be reliable; the internal consistency as well as the test-retest reliability proved to be high, and also the validity of the scale was found to be acceptable (see also Aartman, Van Everdingen, Hoogstraten & Schuurs, 1998; Klingberg, 1994; Klingberg, Vannas Löfqvist & Hwang, 1995b; Milgrom, Jie, Yang & Tay, 1994). In the present study the parental version of the CFSS-DS was used, since younger children were unable to complete the questionnaire themselves. Research has shown that parents are well able to assess their child's level of dental fear, by using this version of the CFSS-DS (Klingberg, Berggren & Norén, 1994; Milgrom et al., 1994).
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In addition to the CFSS-DS, the parent was asked to rate his or her own dental fear on a similar 5-point Likert scale, from 1) ‘not afraid at all’ to 5) ‘very afraid’ (Milgrom, Fiset, Melnick & Weinstein, 1988; Weerheijm, Veerkamp, Groen & Zwarts, 1999). Finally, also the dentist was asked to rate the child’s fearful behaviour during its last dental visit on a similar 5-point Likert scale. The dentists were unaware of the CFSS-DS scores.

Dental history

For all children dental records were retrieved. For each dental visit preceding completion of the CFSS-DS all dental work was noted. Information on the following variables was collected: number of fillings and extractions, total number and nature of dental visits, number of check-up visits before first curative treatment, time period between first visit and first curative treatment session and the child’s age at first visit, at first curative treatment session and at completion of the questionnaire. Also, notes on the children’s dental records indicating behavioural management problems (BMP; see Klingberg et al., 1995a) during previous treatment sessions were collected. These behavioural management problems refer to disruptive behaviour or emotional outbursts, delaying treatment or even rendering treatment impossible.

Data analysis

Stepwise regression analysis was performed with the following treatment variables included: number of extractions, fillings, dental visits, curative treatment sessions, emergency visits, behavioural management problems and the dentists’ fear rating. Also, the level of parental fear and the child’s age, gender and cultural background were included in the analysis. In addition, to further assess differences in latent inhibition and treatment variables between high fearful and low fearful children t-tests for differences in means were performed using a Bonferroni-Holm correction for the number of tests. For this purpose, the study sample was divided into a high fearful group (n=57) and a low fearful group (n=344). Children in the fearful group had CFSS-DS scores of 32 and higher, while children in the low fearful group scored below 32 on the CFSS-DS (Ten Berge et al., in press). The mean CFSS-DS score of the low fearful group was 20.6 (SD 4.0), for the high fearful group 39.1 (SD 8.1).

Results

Child characteristics

The mean fear level of the children in this study was 23.2 (SD 8.1). Between boys and girls in this study no significant difference in fear score was found (22.7 versus 23.9, t=1.49, p=.135). Also, no relation with age was found (p>.05). Children from a non-Western background
(n=35) were found to be somewhat more fearful than children from a Western background (26.2 versus 22.9, t=2.32, p=.021).

Regression analysis
Stepwise regression analysis revealed the number of extractions, the level of parental dental fear, the time period between the first and the last visit, the child’s cultural background and the number of dental visits as significant predictors of CFSS-DS score. However, together these variables explained only 13% of the total scale variance.

To explore the influence of subjective experiences, regression analysis was repeated with also behavioural management problems (BMP) and the dentists’ ratings included.

<table>
<thead>
<tr>
<th>Variables in equation</th>
<th>Beta</th>
<th>t value</th>
<th>sign.</th>
<th>R² (cum.)</th>
</tr>
</thead>
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<tr>
<td>Dentists’ rating</td>
<td>.424</td>
<td>10.32</td>
<td>.000</td>
<td>.254</td>
</tr>
<tr>
<td>BMP</td>
<td>.248</td>
<td>6.02</td>
<td>.000</td>
<td>.307</td>
</tr>
<tr>
<td>Parental fear</td>
<td>.176</td>
<td>4.34</td>
<td>.000</td>
<td>.348</td>
</tr>
<tr>
<td>Months between first and last visit</td>
<td>-.305</td>
<td>-3.98</td>
<td>.000</td>
<td>.362</td>
</tr>
<tr>
<td>Age</td>
<td>.210</td>
<td>2.75</td>
<td>.006</td>
<td>.379</td>
</tr>
<tr>
<td># Extractions</td>
<td>.101</td>
<td>2.42</td>
<td>.016</td>
<td>.389</td>
</tr>
<tr>
<td>Cultural background</td>
<td>.084</td>
<td>2.10</td>
<td>.036</td>
<td>.396</td>
</tr>
</tbody>
</table>

Regression analysis now explained 40% of the variance, by the following variables: the dentists’ clinical fear rating, BMP, parental fear, time period between first and last visit, number of extractions and the child’s age and cultural background (Table 1). After including also the number of check-up visits before the first curative treatment session (n=243) in the analysis, the total amount of explained variance proved to be 47%. Regression analysis for separate age groups (5-7.5 versus 7.5-10 years) generally resulted in similar models. Only a small difference was found for the older age group; the number of extractions was not included in the equation as a significant predictor of CFSS-DS score.

Fearful versus low fearful children
Table 2 shows t-test results for differences in treatment variables between fearful and low fearful children. Significant differences were found in the number of extractions, the number of behavioural management problems (BMP) and in the number of non-curative sessions preceding the first curative treatment session. Also, significant differences in the level of parental fear and the dentists’ fear ratings were found between high fearful- and low fearful
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children. For the other variables no significant differences were found. Behavioural management problems were found at regular check-up visits as well as at curative treatment sessions, implying no strong relation between invasive procedures and behavioural management problems.

Table 2. T-test results (one-sided) for differences in treatment variables between high- (HFG) and low fearful children (LFG).

<table>
<thead>
<tr>
<th></th>
<th>HFG</th>
<th>SD</th>
<th>LFG</th>
<th>SD</th>
<th>p</th>
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<td>Treatment variables:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td># Fillings</td>
<td>4.3</td>
<td>4.6</td>
<td>3.5</td>
<td>4.8</td>
<td>.109</td>
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<tr>
<td># Extractions</td>
<td>1.1</td>
<td>1.6</td>
<td>0.5</td>
<td>1.1</td>
<td>.006*</td>
</tr>
<tr>
<td># Dental visits</td>
<td>13.8</td>
<td>6.4</td>
<td>13.6</td>
<td>5.6</td>
<td>.418</td>
</tr>
<tr>
<td># Curative treatment sessions</td>
<td>3.7</td>
<td>3.5</td>
<td>2.7</td>
<td>3.6</td>
<td>.023</td>
</tr>
<tr>
<td># Visits before first curative treatment session</td>
<td>3.7</td>
<td>3.2</td>
<td>5.4</td>
<td>4.9</td>
<td>.003*</td>
</tr>
<tr>
<td>Months between first visit and last visit</td>
<td>47.8</td>
<td>21.1</td>
<td>51.6</td>
<td>19.3</td>
<td>.085</td>
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<td>Behavioural management problems (BMP)</td>
<td>1.1</td>
<td>1.6</td>
<td>0.4</td>
<td>0.8</td>
<td>.001*</td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>86.8</td>
<td>17.9</td>
<td>88.5</td>
<td>17.4</td>
<td>.244</td>
</tr>
<tr>
<td>Age at first curative treatment (months)</td>
<td>56.1</td>
<td>15.6</td>
<td>60.1</td>
<td>18.1</td>
<td>.097</td>
</tr>
<tr>
<td>Parental dental fear</td>
<td>2.5</td>
<td>1.3</td>
<td>1.9</td>
<td>1.2</td>
<td>.000*</td>
</tr>
<tr>
<td>Dentists' fear rating</td>
<td>2.1</td>
<td>0.9</td>
<td>1.3</td>
<td>0.5</td>
<td>.000*</td>
</tr>
</tbody>
</table>

* significant using a Bonferroni-Holm correction

Discussion

The present study has provided support for a relation between invasive dental experiences and level of dental fear in children. However, the relation with the amount of dental work was found to be very moderate. A significant but weak relation with the number of extractions and curative treatment sessions was found, while with the number of fillings no relation was found. This suggests the relation between dental fear and curative treatment in children to be complex; a difference in the experienced invasiveness between extractions and fillings may exist for children. Furthermore, other aspects seem to be important. The sequence of dental procedures and visits in a child's dental history was found to be related to the children's level of dental fear. That is, low fearful children were found to have experienced more check-up visits before they underwent their first curative treatment than fearful children. This indicates that children with a longer history of non-invasive visits are less likely to develop high dental fear than children who have experienced invasive
treatment earlier in their dental history. Herewith clinical support for the latent inhibition theory is provided (Davey, 1989; De Jongh et al., 1995). It seems that the children’s capacities to cope with potentially invasive visits have increased after a history of non-curative or non-invasive treatment sessions.

Moreover, regression analysis showed that the objective treatment variables together explained only a small percentage of the variance, confirming the notion that other factors are involved besides these actual dental procedures. Exploration of the contribution of the dentists’ behaviour-based fear ratings and of the behavioural management problems in the explained variance indicated that eventually, the emotional nature of a dental visit may be of decisive influence in the acquisition of dental fear. Although of course the causality of this association remains unclear, these behaviour-based variables may reflect the child’s emotional recollection or perception of dental visits to a certain degree. Given that behavioural management problems seem unrelated to invasive procedures or curative treatment sessions, it may thus be that other factors, such as perceived dentist’s behaviour or the child’s temperamental traits, are responsible for a visit to be experienced as traumatic. In conclusion, instead of painful or invasive procedures it might be a child’s subjective perception of a dental visit that is decisive in the acquisition of dental fear. These findings are in line with those of a recent study in which subjective experiences of pain or trauma were found to be more important in the development of dental fear in children than objective dental pathology (Townend et al., 2000). More specifically, the number of traumatic visits and the dentists’ (lack of) empathy were reported as most important etiological factors in child dental fear. Support for a significant role of ‘non-dental’ factors was also provided in other studies (Klingberg et al., 1994 & 1995a; Milgrom et al., 1995); in these studies parental fear and children’s general fearfulness were reported to be involved in the development of dental fear. In the present study also a significant though weak relation with parental dental fear was found, but children’s general fearfulness was not taken into account. It seems plausible, however, that this individual aspect may play an additional or mediating role, and may account for another substantial part of dental fear. In this context, it should also be noted that developmental aspects might mediate the conditioning process. With increasing age, children develop more cognitive abilities and different coping styles, possibly affecting their perception of dental treatment and subsequently, their fear development. For example, it has been suggested that older children are better able to distinguish different treatment phases, and that their more sophisticated cognitive abilities may make them more sensitive to different aspects of the dental situation, such as worries about the dentists’ competencies (e.g., Brown, O’Keeffe, Sanders & Baker, 1986; Rape, Bush & Saravia, 1988; Winer, 1982). However, given that only a small difference between age groups was found, based on the
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present findings no conclusions on such differences in pathways of fear acquisition could be made. More research on this aspect is needed in more extensive age ranges; it may be that these developmental differences may become most prominent in children from 11 or 12 years onward.

Interestingly, it seems that the emphasis in research has shifted from objective to subjective conditioning experiences. The recollection of invasiveness is important, but seems not that strongly related to painful procedures. This observation has important clinical implications; the need for an empathetic and individual approach of children is emphasised. It could be that by providing structure and extra attention for these children, their dental fear may decrease or even be prevented (Ten Berge, Veerkamp & Hoogstraten, 1999). In other words, the fear-eliciting effect of painful treatment may be mediated by the dentists' behaviour. It may be that pain inflicted by a dentist perceived as 'caring' has a less negative impact than pain inflicted by a 'cold' or 'uncaring' dentist (Bernstein, Kleinknecht & Alexander, 1979; Milgrom, Vignesha & Weinstein, 1992). Subsequently, also the need for adequate assessment procedures before starting treatment is stressed to enable dentists to select the most appropriate treatment strategy for children. In conclusion, the present findings have indicated that within the direct conditioning pathway, actual experienced dental procedures seem to play a minor role in the acquisition of dental fear in children, while it was suggested that subjective conditioning experiences may essentially be more decisive in this process. Furthermore, clinical support for the latent inhibition theory was provided; the acquisition of dental fear seems less likely after a history of non-invasive dental visits. Subsequently, by having children visit the dentist regularly from a very young age onward, the acquisition of dental fear may be prevented.
References


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