Factors Predicting a Child's Dental Fear

M. Majstorović[1], I. Škrinjarić[1], D. Glavina[1] and L. Szirovicza[2]

[1] Department of Pedodontics, School of Dental Medicine, University of Zagreb, Zagreb, Croatia
[2] Institute for Anthropological Research, Zagreb, Croatia

A B S T R A C T

The aim of the present study was to determine and assess the variables most involved in the etiology of a child's dental fear. The study was performed on a sample of 89 children aged from 5.5 to 12.5 years and their mothers. The sample comprised 37 children with experience of dental trauma (19 boys and 18 girls) and 52 children without experience of dental trauma (28 boys and 24 girls). Corah Dental Anxiety Scale (DAS) was applied to evaluate the level of the child's (CDAS) and mother's (MDAS) dental anxiety. Broome's Child Medical Fear Questionnaire (CMFQ) was used to assess the child's fear of medical treatment. Hollingshead Two Factor Index of Social Position (ISP) was calculated to assess socio–economic status of the family. Cluster analysis differentiated one group of dentally anxious children with the highest level of maternal anxiety (MDAS = 14.44) and the lowest socio–economic status (ISP = 41.94). Another group of extremely anxious children (CDAS = 14.31) showed the highest fear of medical treatment (CMFQ = 22.08) and rather low socio–economic status. One group represented children with the lowest CDAS (5.63), lowest MDAS (8.46), and lowest CMFQ (13.54). Linear regression analysis showed high correlation between previous traumatic medical experiences and a child's dental anxiety using the linear model CDAS' = b0 + b1   CMFQ. The analysis revealed that a child's dental fear mostly depends on early negative medical experience, while maternal dental anxiety and socio-economic circumstances seem to be of less importance.

Introduction

Behavior management of uncooperative children is of great interest to pediatric dentists who have to deal with problems occurring during their dental treatment. Numerous studies have focused on the physiological principles of transmitting pain impulses, in an attempt to explain pain response through nociceptive theories[1]. It has been established that certain internal and external factors play an important role in pain perception. Some children already have predisposed vul-

493

nerability to develop anxiety, while others appear to be resistant to exogenous influences.

A significant role has been given to personality traits with regard to emotional and behavioral factors in a child's perception of pain and unpleasant situations[1,3]. Environmental influences such as socio-economic status, family influence (maternal dental anxiety), and past medical experience have limited impact on a child's behavior in dental situations and the development of dental anxiety[4]. Although several studies have shown that dental fear in children has multifactorial etiology, previous frightening medical experience and painful dental treatments are two of the most prominent factors[2,5–7]. Recent studies have focused on direct painful and invasive treatments that could provoke dental fear and phobias. The most stressful and fear provoking factors are early unpleasant invasive dental treatment and soft tissue injuries[7,8]. It appears that some psychiatric disorders, and other emotional and behavioral problems also play a significant role in the complex and heterogenic etiology of dental anxiety[2,8,9].

The present study was of a retrospective nature. The aim was to determine the interrelationship between a child's dental anxiety, socio-economic status, previous negative medical experience and maternal anxiety, and to assess the relative importance of some factors in the etiology of dental fear in a Croatian sample of school children and their mothers.

Materials and Methods

The study comprised 89 children who were regular patients at the Department of Pedodontics. Most of them were accompanied by their mothers who facilitated the collection of data and completion of questionnaires. Both children and mothers were interviewed using standard inventories to assess the child's and mother's dental anxiety, the child's earlier medical experience and the socio-economic background of the family. The age of the children ranged from 5.5 to 12.5 years. The study comprised 37 children with experience of dental trauma (19 boys and 18 girls) and 52 children without experience of dental trauma (28 boys and 24 girls).

Before treatment the children and their mothers were required to answer questions in the questionnaires in order to assess their level of dental anxiety. The tests used in this study were Corah Dental Anxiety Scale (DAS) to assess the child's and mother's dental anxiety[10], Broome's Child Medical Fear Questionnaire (CMFQ) for assessment of the child's previous medical experience[11], and Hollingshead Two Factor Index of Social Position (ISP) to assess family socio-economic background[12]. Dental anxiety was measured in children (CDAS) and their mothers (MDAS).

Corah Dental Anxiety Scale (DAS) was used to assess dental anxiety and was applied to the children and their mothers[10]. According to DAS scores children were classified as low anxious (DAS scores 4–8), moderately anxious (DAS scores 9–12), and highly anxious (DAS scores 13–20).

Broome's Child Medical Fear Questionnaire is a twelve–item questionnaire that was applied to the children to assess their previous medical experience[11]. Obtained values by this test ranged from 12 to 36 points. The higher scores signified higher anxiety induced by the child's previous medical experience.

Hollingshead Two Factor Index of Social Position (ISP) was an instrument to measure social position and the child's social background[12]. The higher score values obtained by this index correspond to the lower socio-economical class.

Linear regression analysis was performed with CMFQ as a free variable and CDAS as a dependant variable. Cluster analysis was performed using Ward's method on matrix Euclidean distances in the space of four analyzed variables.

Results

Calculation of correlation coefficients between four original variables revealed significant correlation only between the child's dental anxiety (CDAS) and previous medical fear (CMFQ). This functional interrelationship was presented by linear equation as CDAS' = b0 + b1 CMFQ. The interrelationship within individual groups of children was expressed by linear regression analysis (Table 1). Table 1 presents evaluation of the child's dental anxiety based on fear of medical treatment according to above equation.

Table 1 shows results that explain the significant percentage of variability of dental anxiety as a consequence of previous negative medical experience. In all

four groups interrelationship of dental anxiety (CDAS) and child's fear of medical treatment (CMFQ) is very similar. It is highest in the group of girls with dental trauma ($b_1 = 0.756$). The percentage of the explained variance of a child's dental anxiety is similar in all four groups. It is lowest in boys without previous dental trauma (33%), and very similar in boys with previous dental trauma and girls without experience of dental trauma (about 43%).

The scores between 33% and 44% of total variability are explained by CMFQ for all four groups. The tested children did not differ significantly regarding gender or previous dental trauma experience.

The above assertion that there was no difference among children regarding dental trauma experience or gender is confirmed by results given in Figure 1, which shows that there is no significant difference in the results depending on the slope direction. The same results also show va-

TABLE 1
ASSESSMENT OF A CHILD'S DENTAL ANXIETY (CDAS) BASED ON FEAR OF MEDICAL TREATMENT (CMFQ)

Sample		Regression Coefficient	Standard Error	t value	Level of significance	R^2
Boys with DT	b_1	0.6641	0.18254	3.638	0.002	
	b_0	−0.9223	3.01289	−0.306	0.763	0.4377
Boys without DT	b_1	0.6806	0.18887	3.604	0.001	
	b_0	−1.5475	3.10901	−0.498	0.623	0.3331
Girls with DT	b_1	0.7564	0.23014	3.287	0.005	
	b_0	−3.1293	3.71563	−0.842	0.412	0.4030
Girls without DT	b_1	0.6135	0.14979	4.096	< 0.001	
	b_0	−1.4025	2.67112	−0.525	0.605	0.4326
All participants	b_1	0.6434	0.08954	7.186	< 0.001	
	b_0	−1.2125	1.50325	−0.807	0.422	0.3725

DT = dental trauma; CDAS = Child's dental anxiety according to Corah Scale; CMFQ = Broome's Child Medical Fear Questionnaire; t = value of the statistic test
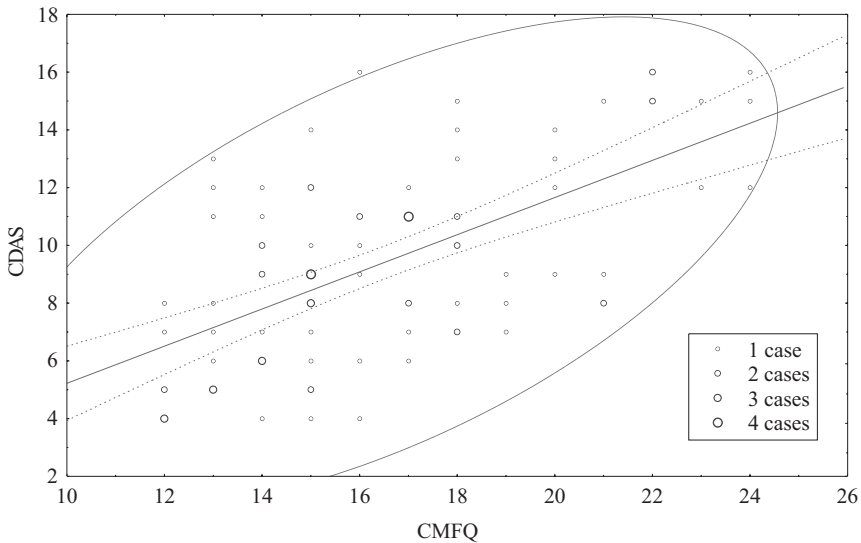
CDAS = Child's Dental Anxiety (Corah Scale);
CMFQ = Broome's Child Medical Fear Questionnaire

Fig. 1. Scatterplot representing interrelationship between CDAS and CMFQ variables for all participants with confidence band (level = 0.95) and confidence elipse (level = 0.95).

riation in interrelationship between the child's dental anxiety (CDAS) and previous medical experiences (CMFQ). These results suggest that there is a certain percentage of variability that could not be explained by using this battery of tests.

Ward's cluster analysis was performed to obtain distribution of mean values for tested variables in a particular group (Table 2). The results thus represent average values of variables for each cluster. The ISP values, which range from 33.88 to 41.94 do not differentiate the above clusters. Three other variables show significant differences between the groups, representing an instrument for characterizing each group. Based on these results it is possible to identify the group of children (fourth cluster) with a significant level of dental anxiety (CDAS = 8.00), highest level of maternal dental anxiety (MDAS = 14.44), and rather poor socio-economic background (ISP = 41.94) (Table 2). It explains the rather negative influence of a mother's dental anxiety and child's previous medical experience on behavior in dental situations. Poor social circumstances also contribute to a certain extent to the development of children's dental fear.

Another group of children (second cluster) show extremely high dental anxiety (CDAS = 14.31), highest fear of medical treatment (CMFQ = 22.08) and rather low socio-economic status (Table 2). These values are even more important, revealing a significant interrelationship between a child' dental anxiety and previous medical experience. The first cluster represents children with relatively high CDAS (10.30), high value of CMFQ (16.07) and low MDAS (8.16). The last group (cluster 3) represents children with lowest CDAS (5.63), low MDAS (8.46), and lowest CMFQ (13.54).

TABLE 2
MEAN VALUES OF THE TESTED VARIABLES REGARDING CLUSTER ANALYSIS AND THE
CRITERIUM OF STATISTICAL EQUIVALENCE

Cluster	ISP	CMFQ	CDAS	MDAS
1	36.17	16.07	10.30	8.16
2	33.88	22.08	14.31	8.54
3	37.56	13.54	5.63	8.46
4	41.94	18.22	8.00	14.44
p	**0.435**	**< 0.001**	**< 0.001**	**< 0.001**

CDAS = Child's dental anxiety according to Corah Scale; MDAS = Mother's dental anxiety according to Corah Scale; CMFQ = Broome's Child Medical Fear Questionnaire; ISP = Hollingshead Two Factor Index of Social Position

Discussion

In this study linear regression analysis showed significant correlation only between CDAS and CMFQ, explaining CDAS as the dependent and CMFQ as the independent variable (Table 1). This relationship was established by linear regression analysis for all subjects together (Figure 1). The significant percentage of total variability of dental anxiety was explained as a consequence of previous negative medical experience. In all groups of patients interrelationship of the child's dental anxiety (CDAS) and child's fear of medical treatment (CMFQ) was very similar. The total percentage of the explained variance of the child's dental anxiety in all groups ranged from 33% to 43% and is explained by the child's medical fear (variable CMFQ). These results also indicate that there is still a certain percentage of the variability that could not be explained by using the applied procedures.

Studies of children with a high level of dental fear revealed that such children also suffered from problems in other behavioral and emotional areas[13,14]. Alwin et al. [15] found that dental fear was significantly higher in a group of children with lower attention span than in the control group[15]. Ten Berge et al. studied the role of parents in the development of a child's dental fear and origins of dental fear in a group of 123 children. They concluded that dental fear was most frequently attributed to previous invasive and painful dental experiences, hospitalization, and history of previous medical problems[14]. Some studies showed that previous painful medical experience was the most decisive factor in dental fear development[14,16,17].

The results of the present study did not reveal significant influence of gender or previous dental trauma on a child's dental fear. The obtained results suggest that the first medical experience is often crucial for the child's future perception of different types of medical treatment, including dental treatment. At a very early age children visit the pediatrician and acquire some medical experience, which affects their attitude to future dental treatment.

Cluster analysis was performed to obtain distribution of mean values for the tested variables in a particular group (Table 2). The analysis revealed clear correlations between CDAS and CMFQ, which explains the influence of previous negative medical experience on a child's dental anxiety. The values of social position (ISP) which range from 33.88 to 41.94 do

497

not differentiate the mentioned clusters. Three other variables were important for differentiation between the groups. The univariate analysis of variance showed significant differences between the groups in the values of tested variables except the ISP variable. On the basis of the obtained results it was possible to identify four groups of children (four clusters). The first cluster represents children with relatively high CDAS (10.30), high value of CMFQ (16.07) and low MDAS (8.16). The second cluster represents a group of children with very high dental anxiety (CDAS = 14.31), the highest fear of medical treatment (CMFQ = 22.08) and low socio-economic status. The third group of children (cluster 3) was characterized by low dental fear. They showed the lowest CDAS (5.63), low MDAS (8.46), and lowest CMFQ (13.54). The last cluster represents children with a significant level of dental anxiety (CDAS = 8.00), the highest level of maternal dental anxiety (MDAS = 14.44), and rather poor socio-economic background (ISP = 41.94).

Difference in the level of a child's dental fear with regard to gender and experience of dental trauma has also been investigated by cluster analysis. The obtained four homogenous groups, referred to here as clusters, do not reflect primary classification of children according to gender and experience of dental trauma (Table 2).

The results of the present study indicate that previous negative medical experience has a strong impact on the appearance of dental anxiety in children. A recent study by Milgrom et al.[18] also showed that most negative reactions in dental situations are related to previous negative medical experience, especially injections. According to Milgrom et al. an injection is one of the most unpleasant dental treatments because it is probably still one of the most painful and threatening procedures[12]. The mere sight of a syringe provokes a threatening and fearful sensation in children. The stressful effect of the unpleasant and painful experience exists regardless of pain etiology[18,19].

Negative and catastrophic thoughts appear in as many as 98% of children and are usually acquired from parents and peers[20]. According to some reports the previous anxious thoughts stored in the memory of each child can produce dental anxiety[21]. Bad experiences of past medical treatments regarded as anticipatory anxiety, can provoke anxious behavior in everyone[22,23]. The experience of physical trauma is also considered a significant anxiety provoking factor[23].

Some studies have shown that females are more anxious than males and that manifested anxiety usually increases with the age of the patients[24,25]. According to some findings the level of dental anxiety in females reaches the peak between 35 and 44 years of age[24,26].

Socio-economic background seems to be of little importance according to the results obtained in this study. This can also be seen in the results obtained by the cluster analysis (Table 2). The relationship between a child's dental anxiety and some other social circumstances, such as the frequency of a child's dental appointments and low anxiety within the group of mothers[27].

The complex and multifactorial etiology of dental fear in children requires analysis of numerous factors and use of sophisticated instruments for assessment of children with behavior problems. Most studies show that a child's dental anxiety is considerably related to previous medical and dental experience, the mother's dental fear and socio-economic status of the family[14,16,17]. It is estimated that around 70% of children with a high level of dental anxiety suffer from (lifetime?) psychiatric illness[13].

The results of the present study, performed on a group of 89 children and

their mothers, indicate that past medical experience should be regarded as the most important factor in a child's dental anxiety. The results also indicate that certain variability in a child's negative and anxious behavior is due to the influ-ence of the mother's anxiety. The large amount of unexplained remaining variability of a child's dental fear requires additional investigations of this problem.

REFERENCES

1. McNEIL, W., A. J. RAINWATER, J. Beh. Med., 21 (1998) 389. — 2. LIDDELL, A., V. GOSSE, J. Behav. Ther. Exp. Psychiatry, 29 (1998) 227. — 3. TOLE-DANO, M., R. OSORIS, F. S. AGUILLERA, J. PEGA-LAJAR, Int. J. Paediatr. Dent., 5 (1995) 23. — 4. ELI, I., N. UZIEL, R. BAHT, M. KLEINHAUZ, Community Dent. Oral Epidemiol., 25 (1997) 233. — 5. LOCKER, D., D. SHAPIRO, A. LIDDELL, Community Dent. Health, 13 (1996) 86. — 6. TEN BERGE, M., J. S. J. VEERKAMP, J. HOOGSTRATEN, P. J. M. PRINS, Community Dent. Oral Epidemiol., 27 (1999) 181. — 7. TEN BERGE, M., J. S. J. VEERKAMP, J. HOOG-STRATEN, P. J. M. PRINS, J. Dent. Child, 68 (2001) 51. — 8. LOCKER, D., D. SHAPIRO, A LIDDELL, Beh. Res. Ther., 35 (1997) 583. — 9. FREEMAN, R. E., Brit. Dent. J., 21 (1985) 406. — 10. AARTMAN, I. H. A., T. VAN EVERDINGEN, J. HOOGSTRATEN, A. H. B. SCHNURS, J. Dent. Child, 65 (1998) 252. — 11. BROOME, M. E., C. H. C., 14 (1998) 142. — 12. HOLLINGSHEAD, A. B.: Two factor index of social position. (Yale Station New Haven, Connecticut, 1965). — 13. AARTMAN, I. H. A., A. DE JONGH, M. J. VAN DER MEULEN, Eur. J. Oral Sci., 105 (1997) 384. — 14. TEN BERGE, M., J. S. J. VEERKAMP, J. HOOG-STRATEN, J. Dent. Child, 66 (1999) 36. — 15. ALWIN, N. P., J. J. MURRAY, P. G. BRRITON, Br. Dent. J., 171 (1991) 201. — 16. WEERHEIJM, K. L., J. S. J. WEERKAMP, H. J. GROEN, L. M. ZWARTS, J. Dent. Child, 68 (2001) 253. — 17. ŠKRINJARIĆ, I., M. MAJSTOROVIĆ, D. KLJUČARIĆ, Children's and maternal anxiety in relation to DMFT score. In: Abstracts book. (16th Congress of The IAPD, Buenos Aires, 1997). — 18. MILGROM, P., S. E. COLDWELL, T. GETZ, P. WEINSTEIN, D. S. RAMSAY, J.A.D.A., 128 (1997) 756. — 19. MILGROM, P., P. WEIN-STEIN, D. GOLLETZ, B. LEROUX, P. DEMOTO, Paediatr. Dent., 16 (1994) 294. — 20. DE JONGH, A., G. TER HORST, Community Dent. Oral Epidemiol., 23 (1995) 170. — 21. ELI, I., N. UZIEL, R. BAHT, M. KLEINHAUZ, Community Dent. Oral Epidemiol., 25 (1997) 233. — 22. FREEMAN, R. E., Br. Dent. J., 159 (1985) 406. — 23. CARSON, P., R. FREEMAN, Int. J. Paediatr. Dent., 7 (1997) 171. — 24. PERETZ, B., D. ZADIK, Int. J. Paediatr. Dent., 4 (1994) 87. — 25. DESIATE, A., M. FANELLI, V. MILANO, Minerva Stomatol., 46 (1997) 165. — 26. THOMPSON, W. M., J. F. STEWART, K. D. CARTER, A. J. SPENCER, Int. Dent. J., 46 (1996) 320. — 27. KINIRONS, M., M. McCABE, Community Dent. Health, 12 (1995) 226.

M. Majstorović

Department of Pedodontics, School of Dental Medicine, University of Zagreb, Gundulićeva 5, Zagreb, Croatia

FAKTORI PREDVIĐANJA DENTALNOG STRAHA U DJETETA

SAŽETAK

Svrha ovog istraživanja bila je identificirati i procijeniti varijable koje najviše doprinose pojavi straha od stomatološkog liječenja ili dentalnog straha. Istraživanje je provedeno na uzorku od 89 djece u dobi od 5.5 do 12.5 godina i njihovih majki. Uzorak je obuhvaćao 37 djece s prijašnjom traumom zuba (19 dječaka i 18 djevojčica) i 52 djece bez prijašnjih trauma zuba (28 dječaka i 24 djevojčice). Za procjenu dentalne anksioznosti korišten je instrument Corah Dental Anxiety Scale (DAS) u djece (CDAS) i

njihovih majki (MDAS). Strah od medicinskog liječenja mjeren je instrumentom Broome Child Medical Fear Questionnaire (CMFQ). Hollingsheadov Two Factor Index of Social Position (ISP) je korišten za procjenu socio-ekonomskog statusa obitelji. Klaster analizom izdvojena je skupina djece s dentalnom anksioznosti (CDAS = 8.00) čije su majke također pokazivale visoku dentalnu anksioznost (MDAS = 14.44), uz najniži socio-ekonomski status (ISP=41.94). Druga skupina ekstremno anksiozne djece (CDAS = 14.31) pokazivala je i najviši strah od medicinskog liječenja (CMFQ = 22.08) i prilično nizak socio-ekonomski status. Jedna skupina predstavljala je djecu s najnižim dentalnim strahom (CDAS = 5.63), niskom anksioznosti majke (MDAS = 8.46) i najnižim strahom od medicinskog liječenja (CMFQ = 13.54). Regresijska analiza je pokazala visoku korelaciju između prijašnjeg traumatskog medicinskog iskustva i dentalne anksioznosti (CDAS' = b0 + b1   CMFQ. Analiza je pokazala kako dentalni strah djeteta najviše ovisi o ranom negativnom ranom medicinskom iskustvu dok dentalna anksioznost majke i socio-ekonomski status imaju manje značenje.