

EVALUATION OF DENTAL ANXIETY IN ELEMENTARY SCHOOL CHILDREN CORRELATED WITH PARENTAL DENTAL ANXIETY

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EVALUAREA ANXIETĂȚII STOMATOLOGICE A COPIILOR DIN ȘCOALA PRIMARĂ CORELATĂ CU ANXIETATEA STOMATOLOGICĂ PARENTALĂ

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Abstract:

Background: Dental anxiety may manifest on different levels, as fear or dental phobias. Patients that have never had negative experiences in the dental office can develop dental fear or phobia, as a result of hearing about negative experiences from family, friends or the media [8].

Study Questions: Is parental dental anxiety correlated with child dental anxiety?

Study Design: The present study aims to assess the correlation between the anxiety of children and their parents. Our investigation explores the possible existence of more motives linked to dental anxiety, especially when a child hears of bad experiences from family and friends.

Measures and Outcomes: 100 children, patients of the University Clinic of Pedodontics in Cluj-Napoca, Romania and their parents, participated in the survey. They filled in an anxiety questionnaire. Statistical analysis was performed.

Results: The most frequent explanation for dental anxiety in both parents and children is hearing about bad experiences from a relative rather than from personal negative experiences. Values for the coefficient of determination (r^2) were approximately 0.5, indicating that half of the child's anxiety can be explained by the parental anxiety score alone.

Conclusions: It is important to approach the dental anxiety in parents in order to obtain better children compliance for dental treatments.

Key-words: *dental anxiety in children, parental dental anxiety, anxiety questionnaire*

Introduction

The term anxiety derives from the Latin 'angustae'. Angustae means end, tightness and distress [11]. Anxiety is a psychological, physiological and behavioral state produced in humans by a threat, signal of danger or motivational conflict. The physical system is composed of nervous and chemical effects, cardiovascular, respiratory, and sweat gland effects.

Anxiety is a natural response to a situation considered as dangerous and can also develop into a disorder after a period of time [1]. It is difficult to differentiate fear from anxiety in the clinical situation, and the terms dental fear and dental anxiety are often used with the same meaning [13]. Patients with previous negative personal dental experiences had dental anxiety

because they suffered from pain and expected it again [5]. Patients with dental anxiety experienced physiological manifestations the day before or on the day of the dental appointment, such as xerostomia, transpiration and tachycardia [3]. There is a frequent connection between the perception of pain experienced and the level of anxiety sensed by the patient [4].

A previous study [6] has showed a potential link between anxiety and parenting style. Our study examined if the self-perceived anxiety scale could serve as a predictor of total anxiety scores. Furthermore, it has been shown that patients in pain are usually more anxious of dental treatment [15]. Dental anxiety has been found to be strongly related to previous negative dental experiences, thus leading to increased

anxiety levels in children as well as in parents [9]. Other studies have demonstrated the presence of dental anxiety and phobia as well as other types of phobia in adolescents, adults, and the elderly [14, 7, 10].

The main aim of our study was to evaluate the correlation between parental dental anxiety and child dental anxiety. Another major goal was to identify whether or not certain types of variables were linked to total anxiety scores of parents or children. A third objective was to use descriptive statistics in order to examine which types of dental anxiety were most prevalent in parents and in children in our sample of respondents. Additionally, we performed descriptive statistics for the reasons behind dental anxiety, dental procedures associated with anxiety, the possibility of measures to calm anxiety, other types of anxiety not associated with dentistry, anxiety of injection, and dental pain. Self-perceived anxiety was correlated to total anxiety in order to identify whether or not the self-perceived anxiety scale was a useful tool for predicting the total anxiety scores of respondents.

Material and Methods

The survey was conducted on a sample of 100 children and their parents. The inclusion criteria involved elementary school children between the ages of 6-9 years old and their accompanying parents. Exclusion criteria included children younger than 6 and older than 9, or not in elementary school. Further than that, grandparents, siblings or accompaniment other than parents were excluded from the study. Other exclusion criteria were contradictory responses in the questionnaires (e.g. the question of being afraid of injections is answered with yes, but the question if the procedures that they are afraid of in the dental office was answered with no) and incomplete questionnaires.

The study design was observational, analytical and cross-sectional. The selection we made was based on the age of the children, but not on the age of parents. Furthermore, there was no selection in gender or marital status. The questionnaires were handed to children and their parents in the University Clinic of Pedodontics in Cluj-Napoca. Upon receiving the questionnaires, the parents were informed that

both their responses and that of their children would be kept confidential and anonymous, and they gave their consent for this survey. The questionnaires were handed and completed separately by children and parents to avoid sharing responses between them. Furthermore, the questionnaires were expressed in an easy and understandable language, especially for the children. Assistance was offered to children from the clinic staff whenever children were unsure of the questions' meanings. The questionnaire included a total of 15 questions, which consisted of a general anxiety questionnaire (8 questions) and a specific anxiety questionnaire (7 questions).

The general anxiety questionnaire incorporated a collection of data, including demographic information such as age and gender. A self-perceived anxiety scale was used, which had the scope of evaluating anxiety in between 1-10; 1 meant not anxious and 10 very anxious. Also, the time of the last dental visit was included. The data was divided into time intervals, which consisted of increasing time intervals from less than one week to over a year. Furthermore, 3 motives of anxiety were presented, as followed: no explanations for anxiety, hearing of negative experiences from family & friends and unpleasant personal experiences in the past. Respondents were asked to choose the dental procedure associated with the most anxiety. Another question enquired about other types of anxiety that were not related to dentistry (e.g. claustrophobia). In addition, the existence of injection anxiety was asked about. A question about the existence of calming measures was included. Lastly, a question asked about the presence of dental pain.

The specific anxiety questionnaire used an inventory of questions designed to assess anxiety associated with dental visits adapted from Jöhrens Hierarchy Anxiety Questionnaire [2]. The questionnaire had seven categories of anxiety associated with particular types of dental situations which included: the thought of the dental visit (1), being in the waiting room (2), arrival of the dentist (3), caries treatment (4), the sound of drilling (5), injections (6) and tooth extractions (7). Respondents were asked to rate each possible type of situation associated with anxiety in terms of the feeling with which

they usually experienced it. A five-point Likert Scale ranging from relaxed (0 points) to very fearful (5 points) was used to quantify each anxiety association. Each respondent was assigned a total stress score corresponding to the sum of all 7 categories. Therefore, the maximum number of points that could be attained were 35, which meant a very high anxiety score, while the minimum points were 0, indicating a very low anxiety score. Those

values represented the total anxiety score.

Data Analysis

Data obtained from the questionnaires was entered into Microsoft Excel. The Data Analysis Tools Package in Microsoft Excel was used to perform descriptive statistics for the various variables (figure 1).

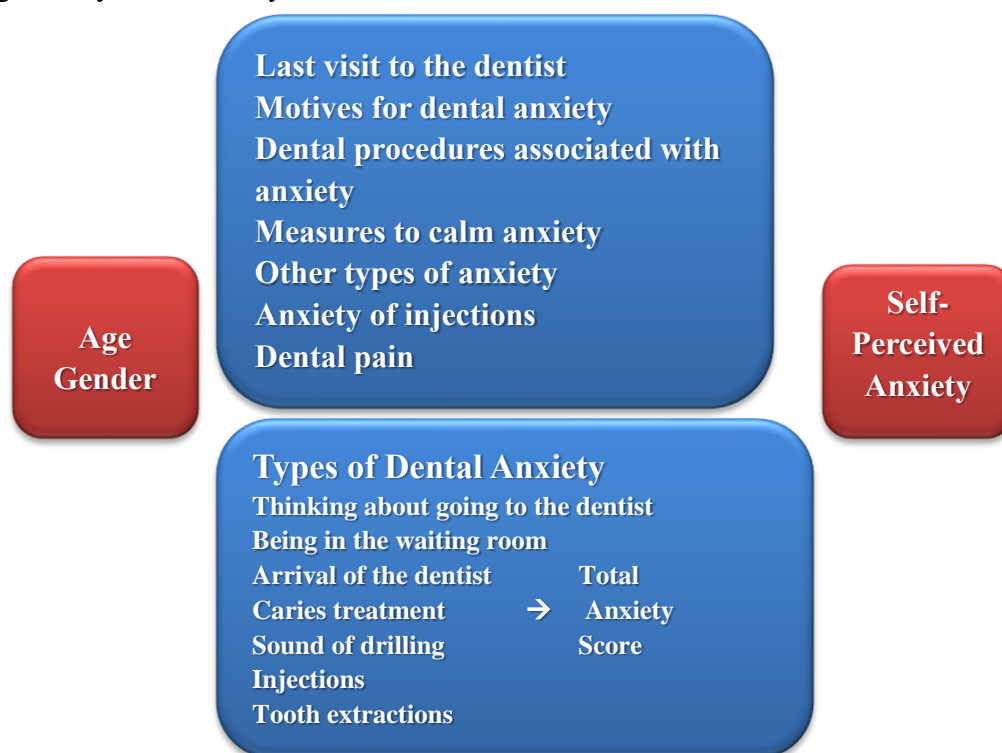


Figure 1 – Variables for which descriptive statistics were performed

Statistical analysis was performed using Microsoft Excel. Single linear regressions were performed in order to explore the correlation between parent and child scores for the various types of dental anxiety as well as total dental anxiety and self-perceived dental anxiety. The studied factors were: thinking about going to the dentist, being in the waiting room, arrival of the dentist, caries treatment, sound of drilling, injections, tooth extractions.

The regressions yielded the coefficient of determination (r^2), the Pearson coefficient, as well as the associated p-value of each regression.

A single linear regression was used to analyse the degree to which the self-perceived anxiety scale could predict total anxiety scores. Finally, the software EpiInfo 7.0 was used to perform t-tests between specific dichotomized variables believed to have a link with total anxiety scores.

Results

Descriptive Statistics:

Gender

The gender of the parents was 73% female and 27% male. The gender of the children was more balanced between males (47%) and females 53%.

Age

Figure 2 shows that the sampled population of parents was between 26 and 46 years old. The average age was 33 years old. Also, 1 in 10 parents were below 29 years old and 7 in 10

parents were between 29 and 37 years old. Only 6 parents were over the age of 40 years old.

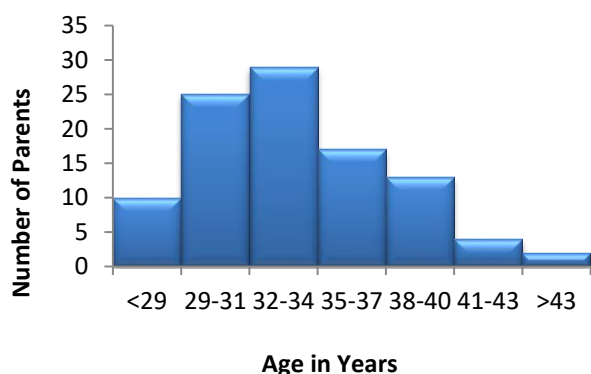


Figure 2 – Age distribution of parents

Approximately 1/3 of the sampled elementary school children were 8 years old (figure 4). Furthermore, figure 4 shows that a quarter of the children were 7 or 9 years old, respectively. About 1 in 7 children were 6 years old (figure 3).

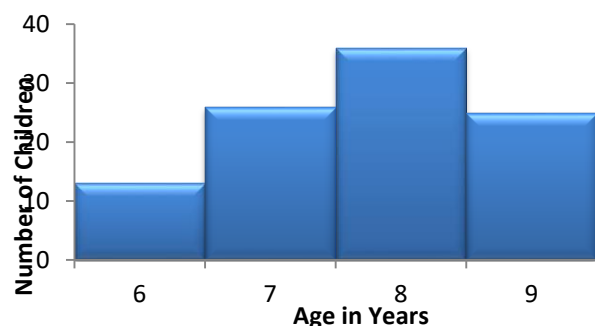


Figure 3 – Age distribution of children

Anxiety associated with the dental visit

Table 1 illustrates that parents and children were mostly relaxed by the thought of going to the dental office. Furthermore, about 1/5 of parents as well as children felt uneasy about visiting the dentist. The feeling of tension was observed to occur in almost 1 in 5 children, while it was nearly non-existent in parents. A very small number of parents or children were fearful of visiting the dentist. No respondent was very fearful of going to the dental office.

Anxiety Scale	Parents (%)	Children (%)
Relaxed	76	60
Uneasy	22	20
Tensed	1	17
Fearful	1	3
Very Fearful	0	0

Table 1 – Anxiety associated with visiting the dentist

Anxiety associated with being in the waiting room

It is shown in table 2 that most of the parents were very relaxed being in the waiting room, while 1/4 of them were feeling uneasy. Half of the children were feeling relaxed by the thought of being in the waiting room, while approximately 1/4 were uneasy like the parents' samples (table 2). Furthermore, the percentage of parents feeling tensed was very small, while the children were presented by 1/4 (table 2). Almost none of the parents were feeling fearful by being in the waiting room, whereas nearly 1/10 of children were showing fear. None of the sampled groups were very fearful.

Anxiety Scale	Parents (%)	Children (%)
Relaxed	69	50
Uneasy	25	21
Tensed	5	21
Fearful	1	8
Very Fearful	0	0

Table 2 – Anxiety associated with being in the waiting room

Anxiety associated with the arrival of the dentist

Table 3 shows that 6 in 10 parents felt relaxed at the moment of the dentist's arrival, while 9 in 20 children felt relaxed by this thought. This was approximately a proportion of 4:3 parents to children. A similar 4:3 ratio was observed for the feeling of being uneasy. More children than parents felt tensed, fearful, or very fearful when seeing the dentist.

Anxiety Scale	Parents (%)	Children (%)
Relaxed	59	45
Uneasy	30	22
Tensed	9	20
Fearful	1	9
Very Fearful	1	4

Table 3 – Anxiety associated with the arrival of the dentist

Anxiety associated with caries treatment

Half of the sampled parents were relaxed, while 4 in 10 children were uneasy at the thought of getting their caries treated (table 4). Additionally, 1/3 of parents and 2 in 10 children felt uneasy. Almost double the number of children felt tensed at the thought of caries treatment in

comparison to the number parents. Ten times more children feared the caries treatment than parents. A few children were very fearful of the treatment. No parents were very fearful.

Anxiety Scale	Parents (%)	Children (%)
Relaxed	50	38
Uneasy	33	19
Tensed	16	29
Fearful	1	10
Very Fearful	0	4

Table 4 – Anxiety associated with caries treatment

Anxiety associated with the sound of drilling

Table 5 illustrates that 4 in 10 parents as well as children were mostly relaxed when hearing the sound of the drill. More parents felt uneasy about hearing the drill in comparison to children (1/3 vs. 1/5). Equal numbers (1/5) of both parents and children were tensed by hearing the drill. Nearly no parent was fearful or very fearful of hearing the bur, whereas 1 in 10 and 1 in 20 children were fearful and very fearful, respectively.

Anxiety Scale	Parents (%)	Children (%)
Relaxed	42	39
Uneasy	34	22
Tensed	22	22
Fearful	1	12
Very Fearful	1	5

Table 5 – Anxiety associated with the sound of drilling

Anxiety associated with injections

Almost half of the children and 1/3 of the parents were relaxed by the thought of an injection. Table 6 shows that double the number of parents were uneasy by getting an injection. About equal numbers of parents as children felt tensed and fearful of injections. Considerable differences were the very fearful samples, which were almost 4 times more in children.

Anxiety Scale	Parents (%)	Children (%)
Relaxed	36	42
Uneasy	26	13
Tensed	18	23
Fearful	17	11
Very Fearful	3	11

Table 6 – Anxiety associated with injections

Anxiety associated with tooth extraction

Table 7 shows that more parents (a quarter) than children (about 1/3) were relaxed by the thought of an extraction. About 1/3 of the parents and 2 in 10 children were uneasy. More parents than children were tensed (3 in 10 vs. a quarter). An equal proportion of parents to children were fearful. None of the parents were very fearful, but slightly less than 1 in 10 children were very fearful.

Anxiety Scale	Parents (%)	Children (%)
Relaxed	25	35
Uneasy	34	21
Tensed	30	24
Fearful	11	13
Very Fearful	0	7

Table 7 – Anxiety associated with tooth extraction

Total anxiety scores

Figure 4 shows that 6 in 10 parents had very low anxiety scores (<6). Around 1/3 of parents had medium anxiety scores (6-15) and very few had high anxiety scores (>15).

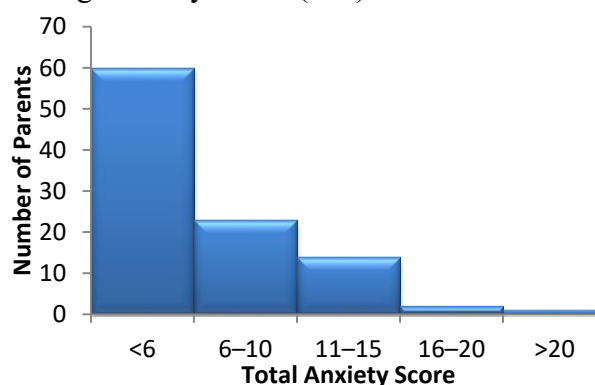


Figure 4 – Total anxiety score of parents

Almost half of the children had very low anxiety scores (<6) as shown in figure 5. Around 1/3 of children had medium (6-15) and about 2 in 10 had high anxiety scores (>15).

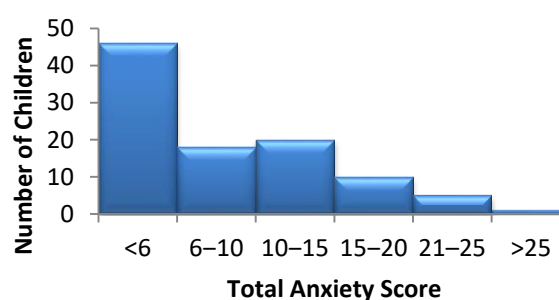


Figure 5 – Total anxiety scores of children

Self-perceived anxiety

Figure 6 illustrates that a quarter of parents had very low self-perceived anxiety scores (=1). About 4 in 10 parents had low self-perceived anxiety scores (2-4) and a quarter had medium (5-7) levels. Less than 1 in 10 parents considered themselves very anxious (8-10).



Figure 6 – Self-perceived anxiety scores of parents

Just above 1/3 of children had very low self-perceived anxiety scores (=1) as shown in figure 7. About 2 in 10 children, 3 in 10 children, and 1 in 7 children had low (2-4), medium (5-7), and high (8-10) self-perceived anxiety scores, respectively.

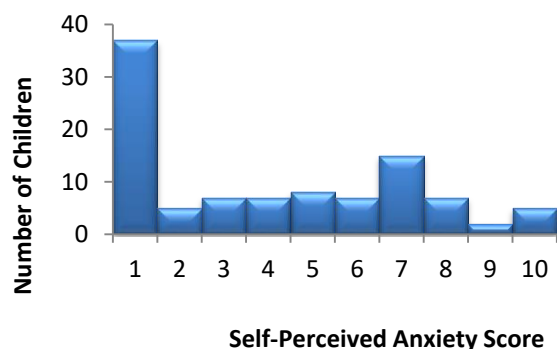


Figure 7 – Self-perceived anxiety scores of children

Time interval since the last visit to the dentist

The general trend that is illustrated by table 8 is that, overall, children had generally been more recently to the dentist than their parents. Nearly 7 in 10 children had visited the dentist in the last month compared to only 1 in 5 parents.

Last Visit to the Dentist	Parents (%)	Children (%)
In the last week	10	31
In the last month	11	38
In the last 6 months	34	26
In the last year	20	5
Over 1 year ago	25	0

Table 8 – Time interval since the last visit to the dentist

Reasons for anxiety when visiting the dentist

Figure 8 shows that almost 4 in 10 parents claimed to have an anxiety of going to the dentist due to hearing about bad experiences from other family members. One quarter of parents reported that they had anxiety due to personal bad experiences, about 1 in 3 had no anxiety, and 1 in 10 could not explain the reason for their anxiety.

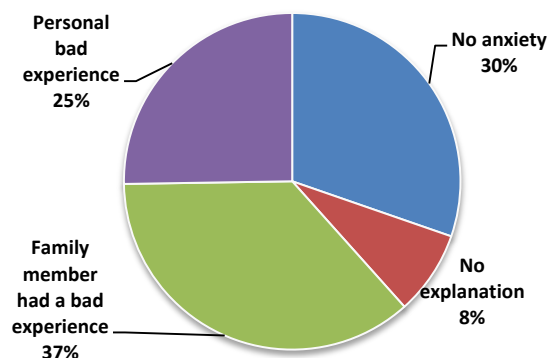


Figure 8 – Reasons for dental anxiety of parents

Nearly one half of children explained that they had dental anxiety due to hearing of bad experiences from family members (figure 9). Unlike their parents, very few children were anxious due to personal bad experience (less than 1 in 10). Around 3 in 10 claimed not to be anxious of visiting the dentist and 2 in 10 children had no explanation for their dental anxiety. Overall, hearing about the bad experiences of a family member was the primary reason that both parents and children had dental anxiety.

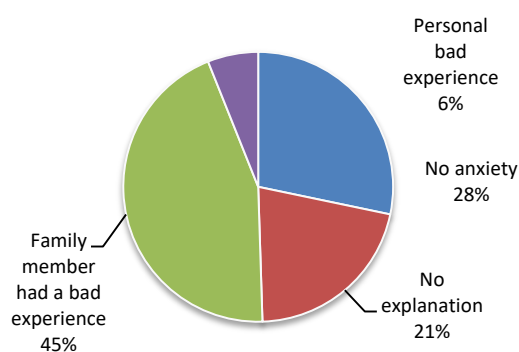


Figure 9 – Reasons for dental anxiety of children

Anxiety related to specific dental procedures

Nearly one half of parents were not anxious by dental procedures, while about 3 in 10 were anxious by extractions and a quarter by injections

(figure 10).

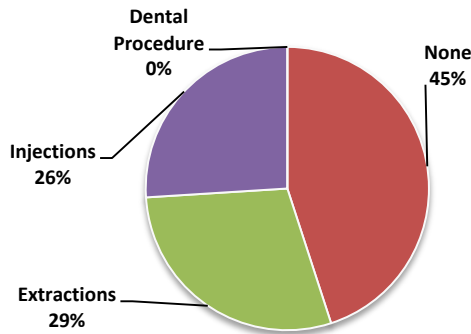


Figure 10 – Anxiety related to specific dental procedures of parent

The most important difference between children and their parents was that about a quarter of children felt anxious when hearing the sound of a dental bur (figure 11). Around 1/3 of children felt anxious at the thought of an injection, while another 1/3 were not anxious of any dental procedure. Less than 1 in 10 children were afraid of extractions.

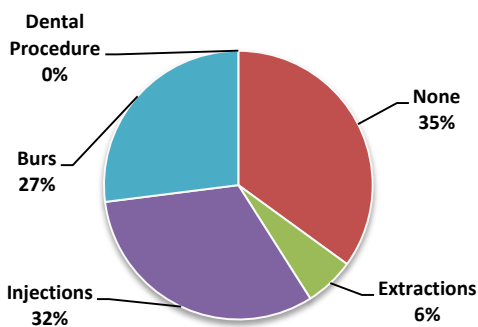


Figure 11 – Anxiety related to specific dental procedures in children

Measures to reduce anxiety

More than half of the parents believed that measures could be taken to reduce their anxiety, while 3/4 of children believed so (figure 12 & 13).

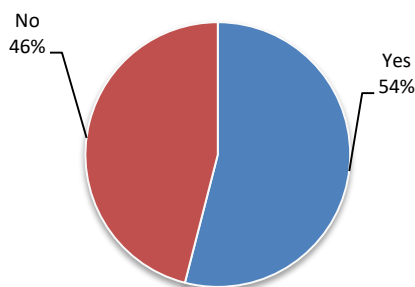


Figure 12 – Distribution of parents who believed in measures to reduce dental anxiety

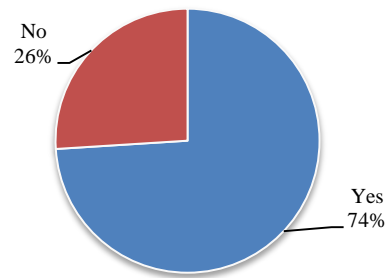


Figure 13 – Distribution of children who believed in measures to reduce dental anxiety

Other types of anxiety

Figure 14 shows that about 2/3 of the parents had no other anxiety. Nearly a quarter presented anxiety of height and 1 in 7 reported claustrophobia. Anxiety of flying was not present in parents. Nearly 8 in 10 children had no other type of anxiety (figure 15). Anxiety of flying was the most frequent anxiety, followed by anxiety of height and claustrophobia.

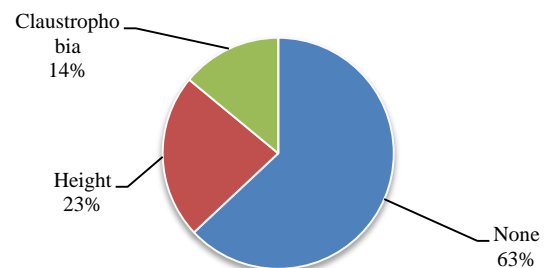


Figure 14 – Other types of anxiety of in parents

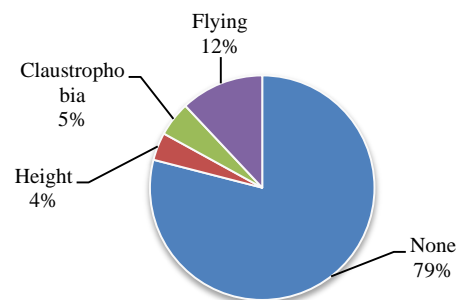


Figure 15 – Other types of anxiety in children

Anxiety of injections

Figures 16 and 17 illustrate that more children were afraid of injections than parents.

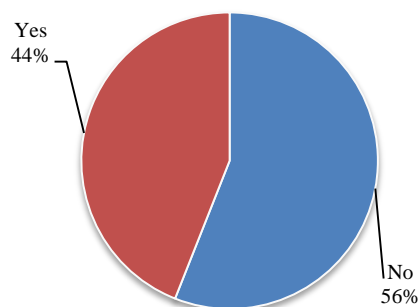


Figure 16 – Anxiety of injections in parents

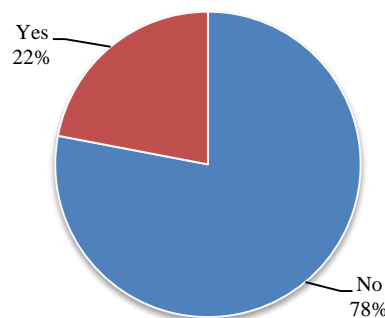


Figure 19 – Dental Pain in children

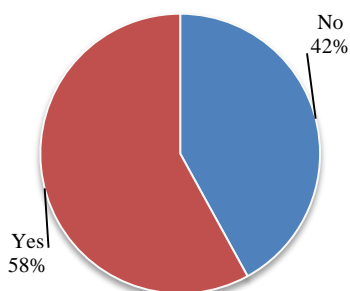


Figure 17 – Anxiety of injections in children

Dental pain

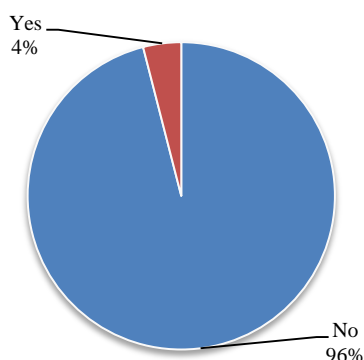


Figure 18 – Dental pain in parents

Analytical Statistics

Parental anxiety as a predictor of child anxiety

The average scores for all types of anxiety were higher in children than in parents (table 9). The largest difference between parent and child mean scores was for caries treatment at 0.55. In descending order was the arrival of the dentist (0.50), being in the waiting room (0.49), sound of the drill (0.37), visiting the dentist (0.35), injections (0.11), and tooth extraction (0.09). The stress scores between parents and children were significantly different for all types of anxiety, except injections and tooth extraction ($p < 0.05$, t-test).

Question	Type of Anxiety	Parents \bar{x}	Children \bar{x}	T-test p value
1	Visiting the dentist	0.27	0.63	5.18E-04
2	Being in the waiting room	0.38	0.87	5.84E-05
3	Arrival of the dentist	0.55	1.05	4.99E-04
4	Caries treatment	0.68	1.23	1.35E-04
5	Sound of drilling	0.85	1.22	0.0147
6	Injections	1.25	1.36	0.552
7	Tooth extraction	1.27	1.36	0.574
Total Anxiety Score		5.25	7.72	6.12E-03
Perceived Anxiety		3.44	4.07	0.0916

Table 9 – Mean scores and t-test p values for anxiety score differences between parents and children

The coefficient of determination (r^2) was close to 0.5 for anxiety of injections, total anxiety, and perceived anxiety when performing a single linear regression between parent and child anxiety scores (table 10). A coefficient of determination of 0.5 indicates that approximately 50% of children's anxiety was correlated with their parent's anxiety. Thus, a parent's anxiety score could predict a child's anxiety score 50% of the time as a single predictor for anxiety of injection, total anxiety,

and perceived anxiety. Also worth mentioning is the fact that parent anxiety scores for the different types of anxiety were not always good predictors for child anxiety scores, but when all seven types of anxiety scores were added into a total anxiety score, a fairly high level of correlation was observed between parent and child total anxiety scores ($r^2=0.507$).

Question	Type of Anxiety	Pearson's r	r^2 value	Regression p value
1	Visiting the dentist	0.525	0.276	2.03E-08
2	Being in the waiting room	0.505	0.255	8.69E-08
3	Arrival of the dentist	0.639	0.408	8.35E-13
4	Caries treatment	0.544	0.296	4.89E-09
5	Sound of drilling	0.599	0.359	4.40E-11
6	Injections	0.500	0.495	1.98E-16
7	Tooth extraction	0.669	0.447	2.86E-14
Total Anxiety Score		0.712	0.507	1.03E-16
Perceived Anxiety		0.709	0.503	1.49E-16

Table 10 – Single linear regression statistics for the different types of anxiety, total anxiety and perceived anxiety comparing parents and children

Perceived anxiety as a predictor of total anxiety

The perceived anxiety scale was highly predictive (~90%) of the total anxiety score in both parents and children (table 11). It was interesting to note that the perceived anxiety scale was more predictive of total anxiety in children rather than in parents. Figures 20 and 21 illustrate the linear regression diagrams where the predictor variable perceived anxiety was plotted on the x-axis and the predicted variable total anxiety on the y-axis.

	Pearson r	r^2 value	p-value
Parents	0.929	0.862	5.19E-44
Children	0.951	0.905	6.23E-52

Table 11 – Single linear regression statistics for perceived anxiety as a predictor of total anxiety for parents and children

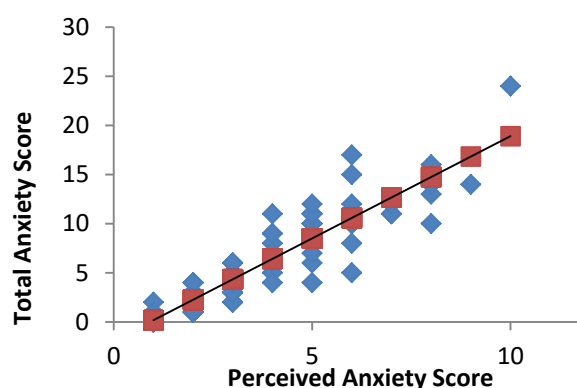


Figure 20 – Regression plot of perceived anxiety and total anxiety for parents

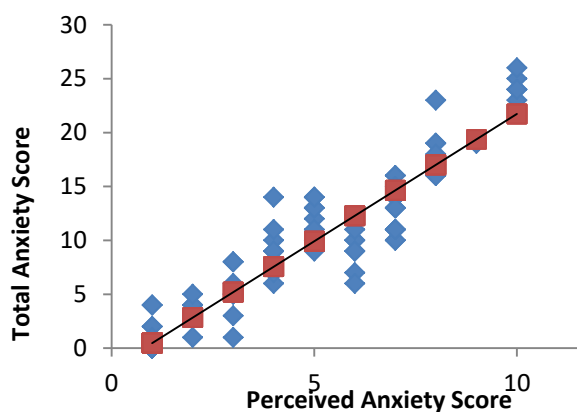


Figure 21 – Regression plot of perceived anxiety and total anxiety for children

Last visit to the dentist and total anxiety

Table 12 shows that parents visiting the dentist more frequently (<1 month since their last visit) had lower total anxiety scores than those visiting less frequently (>1 month since their last visit), although there was no statistically significant difference (t-test, p=0.153). Children visiting the dentist more recently showed lower anxiety scores than those visiting less recently although there was no significant difference (t-test, p=0.454).

	Last Visit to the Dentist	\bar{x} Anxiety	t-test p value
Parent	<1 month	3.86	0.153
	>1 month	5.62	
Child	<1 month	7.35	0.454
	>1 month	8.55	

Table 12 – Last visit to the dentist and total anxiety scores

Hearing about previous bad experiences at the dentist from a family member and total anxiety

Both parents and children who heard of bad experiences at the dentist from a family member had higher total anxiety scores as shown in table 13. There were statistically significant differences between those hearing of bad experiences and those not hearing of bad experiences for both parents and children, respectively (t-test, p=0.0007 and t-test, p=0.0008).

	Bad Experience	\bar{x} Anxiety	t-test p value
Parent	Yes	7.39	0.0007
	No	3.92	
Child	Yes	10.34	0.0008
	No	5.47	

Table 13 – Hearing about previous bad experiences from a family member and total anxiety scores

Measures to calm anxiety and total anxiety scores

Table 14 shows that those parents who believed in measures which could be taken to calm anxiety had significantly higher total anxiety scores in comparison to those who did not believe in measures to calm anxiety (t-test, p=0.000). Children believing in measures to calm anxiety also displayed higher anxiety scores than those

who did not, but there were no statistically significant differences between the two groups (t-test, p=0.215).

	Calming Measures	\bar{x} Anxiety	t-test p value
Parent	Yes	8.24	0.0000
	No	2.70	
Child	Yes	9.27	0.2145
	No	7.18	

Table 14 – Measures to calm anxiety and total anxiety scores

Dental pain and total anxiety scores

There were no statistically significant differences (t-test, p=0.609) between the total anxiety scores of parents who had dental pain and those not having dental pain (table 15). Children presenting dental pain were slightly more anxious than those not presenting dental pain, although there was no significant difference between the two groups (t-test, p=0.816).

	Dental Pain	\bar{x} Anxiety	t-test p value
Parent	Yes	3.75	0.6090
	No	5.31	
Child	Yes	8.05	0.8159
	No	7.63	

Table 15 – Dental pain and total anxiety score

Gender and total anxiety scores

Table 16 shows that male parents displayed significantly lower anxiety scores than their female counterparts (t-test, p=0.0003). For children, males also had significantly lower anxiety scores than females (t-test, p=0.0077).

	Gender	\bar{x} Anxiety	t-test p value
Parent	Male	2.33	0.0003
	Female	6.33	
Child	Male	6.21	0.0077
	Female	8.06	

Table 16 – Gender and total anxiety score

Discussion

Our study was able to demonstrate that parental dental anxiety was related to child dental anxiety for the category of anxiety of injection, as well as, total anxiety scores and self-perceived

anxiety scores. Values for the coefficient of determination (r^2) were approximately 0.5, therefore indicating that half of a child's anxiety could be explained by the parental anxiety score alone.

As predicted, hearing of previous bad experiences from family members was significantly associated with higher total anxiety scores to a very high degree in both parents and children (t-test, $p < 0.001$). Furthermore, males presented significantly lower total anxiety scores compared to females to a very high degree in both parents and children (t-test, $p < 0.001$). How recently a respondent visited the dentist last and the presence of dental pain had no link to total anxiety scores. Lastly, for the variable related to one's belief in possible measures to reduce dental anxiety, we found that parents believing in such measures had significantly higher total anxiety scores to very high degree (t-test, $p < 0.001$). There was no significant difference between children believing or not believing in measures to reduce anxiety.

To our surprise, the self-perceived anxiety scale showed a very high correlation with the total anxiety scores in both parents and children. This supports the idea that the self-perceived anxiety scale is a very good tool for predicting total anxiety scores as the coefficient of determination in the linear regression model was over 0.85 in both parents and children. It was surprising to note that the self-perceived anxiety scale better predicted total anxiety scores in children rather than in parents.

The most frequent explanation for dental anxiety in both parents and children was hearing of bad previous experiences from a family member rather than from personal negative experiences. The majority of parents and children did not present other types of anxiety. The procedure linked most with dental anxiety was extractions in parents, and injections in children.

It was interesting to note that the majority of parents accompanying their children to the dentist were female (73%). Our study confirmed that female parents had significantly higher total anxiety scores than male parents (t-test, $p = 0.0003$), with the mean total anxiety scores of female parents being almost 3-fold higher than for males, 6.33 and 2.33, respectively. Furthermore, our study also found that parental total anxiety explained some 50% of a child's total anxiety

score alone (single linear regression $r^2 = 0.507$, $p = 1.03E-16$). Therefore, the data suggests that a proportion of the anxiety as measured in our study from the sample of children may have been due to the fact that they had an accompanying female parent.

A lower proportion of children than parents reported feeling relaxed at the thought of visiting the dentists (60% vs. 76%), being in the waiting room (50% vs. 69%), arrival of the dentist (45% vs. 59%), and the need for caries treatment (38% vs. 50%). An approximately equal number of parents (42%) and children (39%) felt relaxed when thinking about the sound of the drill. However, a higher ratio of children rather than parents was relaxed at the idea of an injection (42% vs. 36%) or an extraction (35% vs. 25%). These findings indicate that what children and adults appraise as determinants of dental anxiety are partially different. The first five types of dental anxiety are related to the anticipation of an event as no active dental treatment is being performed. It can thus be stated that parents have stronger anticipatory anxiety in comparison to children. Meanwhile, children are apparently more anxious of active dental procedures such as an injection or an extraction than their parents. An explanation for this may be that children react to active stimuli, rather than anticipatory stimuli which they cannot associate to as well as adults. Moreover, adults may be more rational about active dental procedures than children, thus explaining why they presented lower dental anxiety scores for injections and extractions.

Histograms presented in figures 4 and 5 illustrate that the distribution of total anxiety scores was skewed to the left for both parents and children. This signifies that, on the whole, the sampled population was preponderantly not anxious. In comparing the distribution of parents and children, a higher number of children had total anxiety scores > 10 when compared to parents (36 vs. 17). This indicates that a substantially higher proportion of children (more than double than that of parents) had higher levels of dental anxiety.

Self-perceived anxiety distributions seen in these histograms from figures 6 and 7 mirrored the pattern of the total anxiety distribution in that values were skewed to the left. However, there was a more graded descending slope to the right for parents indicating a more evenly spread out

distribution of self-perceived anxiety scores. Very few parents seemed to acknowledge that they were extremely anxious as very few parents had scores of 9 or 10. Thus, it seems that parents judged themselves preferentially as having low or moderate anxiety. On the other hand, the distribution of children's self-perceived anxiety was mostly clustered on the left side of the histogram and a plateau was observed between the score of 2 and 9, with no gradually descending slope. More children than adults had very high levels of self-perceived anxiety (scores of 9 and 10). This may indicate that children are not as consistent in their thinking as parents, which was mentioned above as one of our study's limitations.

The ratio of the time passed since the last visit to the dentist was inversed between parents and children (table 8). In other words, the majority of children had been to the dentist very recently (69% of them in the last month), while the majority of parents had not been to the dentist recently (79% of them had not been to the dentist for 6 months or more). It seems reasonable that the majority of children made dental visits more recently than their parents. This is because more dental care and supervision is required during the ages of 6-9, due to changing of dentitions, and a higher probability of problems to occur at this life stage.

The time interval since the last visit to the dentist had no significant association with anxiety (t-test, $p > 0.05$) in neither parents nor children. However, upon inspection of the averages, parents as well as children visiting the dentist more recently tended to have lower mean total anxiety scores than those who had not visited the dentist for over a month. It may be possible that an individual's anxiety may decrease with more frequent dental visits. This is because the person may become accustomed to dental procedures, and thus, be less fearful of dental treatment in time.

The reason most associated with dental anxiety when visiting the dentist was hearing of bad experiences from family members in both parents (37%) and children (45%). This was not expected, as we believed that personal negative experiences would be the predominant reason. Moreover, we also found that hearing of bad experiences from family members was associated with higher total anxiety scores to a significant degree in both parents and children (t-test,

$p < 0.001$). The data suggests that the experiences or opinions of other people have a marked influence on one's perception of going to the dentist. Our study showed that dental anxiety may indeed be influenced by listening to other people as the largest proportion of respondents chose hearing of bad experiences from others as the major motive for dental anxiety. The idea that dental anxiety may be influenced by other individuals is further supported by the fact that 50% of the total anxiety scores of children were explained just by their parents' total anxiety scores (single linear regression $r^2 = 0.507$). Past personal negative experiences was only reported by 6% of children. An explanation for this is that many children may have not undergone such extensive dental treatments as their parents and could thus not recall any bad experiences.

Children displayed dental anxiety related to the sound of burs, while no parents presented this type of dental anxiety. This suggests the previous idea that many children have probably not undergone extensive dental treatment in order to assure themselves that the bur is not as harmful as they think. Although parents reported feeling uneasy or tensed about drilling (table 5), very few were fearful or very fearful in comparison to children (2% vs 17%). Their tension was also probably due more to the fear of experiencing pain rather than the sound of the bur itself. Injections were chosen as the dental procedure most associated with dental anxiety by more children than parents (32% vs. 26%); this is indicative of the idea that lack of dental experience in children may play a role on their perception of injections as being harmful. Our data support the fact that anxiety of injections was more prevalent in children (58% of children were anxious of injections in comparison to 44% of their parents and 45% of children felt tensed, fearful, or very fearful of injections compared to 38% of parents).

Surprisingly, more children believed in possible measures to reduce dental anxiety than parents (74% vs. 54%). Furthermore, both parents and children who believed in methods to reduce dental anxiety had higher mean total anxiety scores than those not believing in it, in spite of the fact that only parents had statistically significant differences (t-test, $p < 0.001$). A possible explanation for why respondents who believed in measures to reduce anxiety had higher anxiety

levels could be that they inherently presented anxiety and wished to reduce it. Those respondents not having high anxiety probably felt no need to reduce anxiety, and thus did not believe in measures to reduce it. This statement would also explain why more children than parents believed in possible measures to reduce anxiety; there were more children than parents with higher levels of total anxiety (figure 5 vs. figure 4). Cognitive Behavioural Therapy (CBT) was proved to be an efficient treatment for children and adolescents that presented dental anxiety [12]. Also virtual reality (VR) distraction systems may reduce discomfort and pain for patients with mild to moderate anxiety and fear [16].

A higher proportion of children presented no other types of anxiety when compared to their parents (79% vs. 63%). Children may have less other types of anxiety due to less life experience. Anxiety in parents may be a manifestation of stress or depression, which is less likely to affect children.

Dental pain was not found to be linked to dental anxiety neither in parents nor in children (t-test, $p > 0.05$). Parents who had dental pain presented lower mean anxiety scores, while children presenting pain presented slightly higher mean anxiety scores than children having no pain. In our study, there was no evidence that indicated a link between dental pain and dental anxiety.

The most surprising result in our study was that the perceived anxiety scale was a remarkably good predictor of total anxiety scores in both the parental and the child linear regression models, having high coefficients of determination, $r^2 = 0.862$ and $r^2 = 0.905$, respectively. It was an equally grand surprise to note that the child regression model had greater predictive power than that of parents. Although we have previously claimed that children may lack rationale or consistency when answering questions in our survey, it does seem that in this particular case we have been contradicted. It is possible that children may have been overtly more honest, or less scrutinizing in their thoughts, when appraising their perceived dental anxiety than their parents. Sometimes overthinking a question may produce false beliefs.

Lastly, it was interesting to note that the total anxiety score had a higher coefficient of determination when correlating parents' and children's anxiety to any type of dental anxiety

used alone in a regression (for example, using parents' anxiety of injection to predict children's anxiety of injection scores). This suggests that the incorporation of multiple variables (multiple types of dental anxiety) worked synergistically to increase the predictive capacity of children's total anxiety scores as a function of parental total anxiety.

Conclusions

About half of the dental anxiety of a child could be explained by the parent's dental anxiety alone. Visiting the dentist recently was not significantly associated with higher dental anxiety scores. On the contrary, visiting the dentist more frequently led to lower anxiety scores.

Hearing about previous bad experiences at the dentist from friends and family members was significantly linked to a higher dental anxiety score. Believing in measures to calm dental anxiety was significantly linked to higher anxiety scores in parents. Children believing in these measures also showed higher anxiety scores, but results were not statistically significant.

Presenting dental pain was not significantly linked to higher dental anxiety scores. Males had significantly lower anxiety scores than females in both parents and children. The motive most associated with dental anxiety was hearing of bad experiences from friends and family members in both children and parents. The majority of respondents with dental anxiety presented no other types of anxiety. The dental procedure most associated with anxiety was injections for both parents and children. The self-perceived anxiety scale was an excellent predictor of total anxiety scores in both parents and children.

A good knowledge of the factors that may cause patient anxiety in dental office is the basis for a suitable approach to this widespread problem, resulting in increased patient compliance and creates the premises necessary to achieve appropriate and high quality dental treatment in the best conditions

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