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The relationship between children and caregivers dental anxiety in Brazilian children.

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Abstract

Background: Despite advances in Dentistry, anxiety and fear are common among children and adults, constituting a barrier to dental care.

Aim: To assess children's and caregivers' fear and anxiety towards dental treatment, identifying the relationship between caregivers' dental history and their perception of their children's fear/anxiety.

Methods: Cross-sectional, descriptive and analytical study in a university dental clinic. Socio-demographic questionnaire, the Children's Fears Survey Schedule-Dental Sub-scale and Venham Picture Test were used for data collection.

Results: 115 pairs of children/caregivers participated. 14 caregivers (12.2%) and 10 children (8.7%) presented fear/anxiety. Children (age 7.9 ± 1.7 years) fear/anxiety related to doctors and dentists were similar. There was no relationship between gender, age, previous dental experience or socio-economic status and children's dental fear/anxiety. Correlation ($r=0.409$; $p<0.001$) was found between caregivers' perception of their children's fear/anxiety and the dental fear/anxiety self-reported by children. This relationship was not strong, and other factors should be considered. Caregivers do not project their dental fear/anxiety onto their children but they are able to predict their dental fear/anxiety.

Conclusion: Caregivers' fears do not interfere with their perception of their children's fear/anxiety, and they do not project their fears onto their children. However, they can predict their child fear and anxiety towards dental treatment.

Keywords: Dental anxiety, Dental care for children, Caregivers, Pedodontics.

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Introduction

Despite technological advances in modern Dentistry, anxiety and fear are common among children and adults, constituting a significant barrier to dental care, interfering with regular oral health care [1].

Fear is part of childhood development. It is usually transitory and does not produce major disruptions in child's daily life. Fear can generate anxiety, which, in turn, can be defined as a response to a situation in which the source of a threat to the subject is not clearly defined [2]. Although the ability to experience fear is an innate biological function, fear responses to certain objects and situations are mostly acquired through learning [3].

One of the factors that can exacerbate feelings of fear in a child is living with fearful people. In this context, the caregiver assumes the role of reference to the child, which while displaying insecure behavior, can generate anxiety in their child. Therefore, the caregiver's anxiety is considered one of the factors that influence the fear during dental treatment [4,5]. However, it is unclear whether the degree of anxiety and fear of caregivers play any influences upon their perception over the level of anxiety of their children

and whether the caregivers are able to accurately foresee the level of anxiety and fear of their children.

The assessment of caregivers' anxiety and the behavioral manifestations of children have the power to assist the professional in predicting child's reactions and getting ready to intervene in advance. Early intervention can affect the quality of care provided, as well as the future levels of fear and anxiety, which, in turn, may hinder the adherence to the treatment and the oral health of the child (future adult).

One way to assess the level of fear and anxiety in children and their guardians is by using tools that ensure the reliability of the results [6]. Some of the most used instruments for this assessment among children undergoing dental treatments are the Behavior Scale, Dental Anxiety Scale, Short Dental Anxiety Inventory (S-DAI) and the Children's Fears Survey Schedule Dental Subscale (CFSS-DS), which are characterized as questionnaires that address different aspects of fear, anxiety and behavior caused by dental procedures or other situations [2-22]. There are also instruments that are based on projective text-free tests (which enables its use with illiterate people), like the Venham Picture Test and the Mood Assessment via Animated Characters (MAAC) [2,13,14,19,21]. However, the assessment with the latter instrument requires a computer, which hinders its use in some circumstances [6,15].

Fear and anxiety can make it difficult, at different levels, for performing children dental treatment, creating an atmosphere of tension for both the dentist and their patients. It can also result in an unsatisfactory treatment or even prevent its fulfillment. Anxiety and dental fear are considered multifactorial conditions; there are several variables that can influence these conditions, such as family interference, socioeconomic factors, age, child's temper, among others [1,8,13,23]. However, few studies assess, in the same group of people, the relationship between fear and anxiety among children and their caregivers, as well as the caregiver's prediction of fear and anxiety experienced by children during dental treatment.

Within this context, the aim of this study is to assess fear and anxiety among children and their caregivers, identifying the relationship between caregivers' dental history and their perceptions of their children's anxiety before dental treatment.

Materials and Methods

This is a quantitative, descriptive and analytical cross-sectional study conducted in the waiting room of the Pediatric Clinic of the Dentistry School of a private university in the State of Ceará, Northeastern Brazil.

The study comprised caregivers and children aged between 5 and 11 years old. The Brazilian Child and Adolescent Statute, Act No. 8.069/90, defines "child" as a period of life that goes up to incomplete 12 years of age [24]. It is largely known that at age 5 the children have the cognitive ability to verbalize and express their feelings, which justifies the choice of this age group for this study. Additionally, these ages are most commonly studied in the literature, which makes it easier for the comparison of the findings of this research with other studies within this field [13,16,23].

Inclusion criteria were: children accompanied by their caregiver with prior dental history (child has had at least one dental appointment in a dental clinic) and without motor, sensory, cognitive and communication impairment. Exclusion criteria were: Children that were having their first experience at the dentist or that have not been to the dentist before. This excluding criteria was chosen do to the understanding that the fear of the unknown can be a constant in young children, as well as to guarantee that the interviewed children had been minimally exposed to the dental environment.

The research sample was computed based on a simple random sampling. The confidence level was set at 90% with a significance level of 5%. With a universe of 200 children (number of children enrolled in the Pediatric Clinic of the University of Fortaleza in the previous semester) a sample of 115 pairs (child-caregiver) was reached. As the sample size was considerably large compared to the estimated universe, every child attending the Pediatric dental clinic, which fitted the inclusion and exclusion criteria, were invited to participate in the study.

An instrument with five parts was used for the caregivers' interviews: 1. socioeconomic factors, 2. previous dental history, 3. past dental history of his/her child, 4. his/her fear and anxiety in relation to medical and dental situations, according to the Children's Fear Survey Schedule Dental Subscale (CFSS-DS/A1) and 5. Fear and anxiety of their children in relation to medical and dental situations (CFSS-DS/A2).

With regard to children, an instrument with two parts was applied: the Children's Fear Survey Schedule Dental Subscale (CFSS-DS/A3) to assess the child's fear and anxiety and the Venham Picture Test (VPT) as a measure of the emotional state at the time of the survey.

The CFSS-DS was proposed by Cuthbert et al. [25] and it is validated in Portuguese Josgrilberg [13]. It is objective, easy to apply and use, being widely used in research on dental fear. This scale consists of 15 items related to different aspects of dental treatment, such as high-speed dental drill or injections and medical situations. Each item features a score from 1 to 5, ranging from "no fear" to "very afraid." The total sum of scores reaches at least 15 points and a maximum of 75 points. A person who presents fear in more than 50% of the 15 situations is considered to have fear (scores ≥ 38) [8,25].

Besides the use of the CFSS-DS for caregivers and children, the Venham Picture Test (VPT) was also used to measure

the fear and anxiety in children. The VPT is constituted by a set of eight pairs of figures expressing various emotions [21]. Children are asked to point out at the picture that they look like at the time of the interview (just before the dental treatment). For a better identification, they were exposed to images of male or female individuals. Thus, this tool for assessing fear and anxiety allows children to demonstrate both their positive and negative emotional state. It is a projective test, which facilitates the child's identification with the situation, making its application easy and quick [12,13].

The instruments were applied individually and by two different researchers, which were trained by the co-authors MVLS and APGFVM, in both analyzed groups (caregivers and children), avoiding interference in the answers given by the study subjects.

The quantitative analysis was performed using the Statistical Package for Social Science, version 19.0 (SPSS Inc., Chicago, IL, USA). The research was approved by the Research Ethics Committee of the University of Fortaleza (Opinion No. 135.219/2012). Parents gave written and informed consent for themself and their child participation. Children also verbally accent to their participation.

Results

The study comprised 230 people: 115 children and 115 caregivers. Of the 115 children, 74 (64.3%) were females. Mean age was 7.9 years (SD ± 1.7). Of the 115 guardians, 79 (68.7%) were mothers, 14 (12.2%) fathers and 12 (10.4%) grandparents. Among the interviewed guardians, 38 (33%) had a complete high school education, while 30 (26.1%) of them had an incomplete elementary school education and only two (1.7%) had never studied. The family income of 85.2% of the interviewees was up to two minimum wages (about 600 US dollars).

Table 1 shows the results of dental experience of children and their caregivers. These results were compared by the Pearson's chi-square test, which showed different characteristics between the two groups.

Caregivers informed about their own levels and their children's levels of anxiety and fear in dental and medical situations. Additionally, moments before the dental treatment at the Pediatric Clinic, children responded about the level of anxiety and fear they felt in medical and dental situations and identified in the VPT their emotional state at the time of the survey.

Table 2 shows the results of these issues and the comparison between the degree of fear and anxiety of caregivers and their expectations concerning their children, as well as the expectation concerning children's anxiety and fear (from the caregiver perspective) and their real anxieties and fears (indicated by the children themselves) during medical and dental situations.

Table 1. *Sample distribution according to dental experience of the child and caregivers (%), as well as comparison test (Chi-square Test) between the two studies groups (Fortaleza, Brazil 2012)*

	Groups*		
	Garegiver n (%)	**Child n (%)**	**Pearson's Chi-square test**
Was it easy to let the dentist examine your mouth?			
YES	108 (93.9)	103 (89.6)	
NO	7 (6.1)	12 (10.4)	
Did you allow the treatment was accomplished?			
YES	114 (99.1)	102 (88.7)	
NO	1 (0.9)	13 (11.3)	
Were you very nervous during the treatment? / Was it necessary to hold the child?			0.156
YES	66 (57.4)	24 (20.9)	
NO	49 (42.6)	91 (79.1)	
Have you already been anesthetized?			0.887
YES	108 (93.9)	69 (60)	
NO	7 (6.1)	46 (40)	0.553
Did you cry during the dental consultation?			
YES	13 (11.3)	44 (38.3)	0.416
NO	102 (88.7)	71 (61.7)	0.017
Are you afraid of dentists? / Does the child report being afraid of the dentist?			0.148
YES	44 (38.3)	39 (33.9)	
NO	71 (61.7)	76 (66.1%)	0.216
Are you anxious?			
YES	90 (78.3)	83 (72.2)	
NO	25 (21.7)	32 (27.8)	

Table 2. *Distribution of percentages (%) of answers concerning the situations presented in the CFSS-DS for the caregivers (A1), caregivers' perception of children (A2) and children (A3), Fortaleza, CE – 2012*

What do you feel in such situations?	Caregivers A1 (%)	Caregiver/Children A2 (%)	Children A3 (%)
Dentist			
No fear	64 (55.7)	74 (64.3)	89 (77.4)
Very little	27 (23.5)	15 (13.0)	15 (13.0)
Fear	8 (7.0)	12 (10.4)	6 (5.2)
Pretty much afraid	4 (3.5)	10 (9.0)	0 (0)
Very much afraid	12 (10.4)	13 (11.3)	5 (4.3)
Doctor			
No fear	103 (89.6)	80 (69.6)	83 (72.2)
Very little	6 (5.2)	20 (17.4)	13 (11.3)
Fear	2 (1.7)	6 (5.2)	9 (7.8)
Pretty much afraid	1 (0.9)	0 (0)	0 (0)
Very much afraid	3 (2.6)	9 (7.8)	10 (8.7)
Injection			
No fear	73 (63.5)	28 (24.3)	29 (25.2)
Very little	20 (17.4)	29 (25.2)	21 (18.3)
Fear	5 (4.3)	10 (8.7)	14 (12.2)
Pretty much afraid	2 (1.7)	5 (4.3)	1 (0.9)
Very much afraid	15 (13.0)	43 (37.4)	50 (43.5)
Having somebody examine your mouth			
No fear	98 (85.2)	93 (80.9)	99 (86.1)
Very little	13 (11.3)	13 (11.3)	6 (5.2)
Fear	2 (1.7)	5 (4.3)	6 (5.2)
Pretty much afraid	1 (0.9)	0 (0)	0 (0)
Very much afraid	1 (0.9)	4 (3.5)	4 (3.5)
Having to open your mouth			
No fear	104 (90.4)	92 (80.0)	108 (93.9)
Very little	9 (7.8)	18 (15.7)	4 (3.5)
Fear	1 (0.9)	2 (1.7)	0 (0)
Pretty much afraid	0 (0)	0 (0)	0 (0)
Very much afraid	1 (0.9)	3 (2.6)	3 (2.6)
Having a stranger touch you			
No fear	46 (40.0)	42 (36.5)	49 (42.6)
Very little	33 (28.7)	43 (37.4)	23 (20.0)
Fear	8 (7.0)	6 (5.2)	16 (13.9)
Pretty much afraid	3 (2.6)	1 (0.9)	0 (0)
Very much afraid	25 (21.7)	23 (20.0)	27 (23.5)
Having someone look at you			
No fear	76 (66.1)	81 (70.4)	95 (82.6)
Very little	22 (19,1)	21 (18.3)	13 (11.30)
Fear	5 (4.3)	5 (4.3)	2 (1.7)
Pretty much afraid	0 (0)	0 (0)	0 (0)
Very much afraid	12 (10.4)	8 (7.0)	5 (4.3)
The dentist drilling			
No fear	73 (63.5)	65 (56.5)	82 (71.3)
Very little	20 (17.4)	19 (16.5)	11 (9.6)
Fear	6 (5.2)	12 (10.4)	9 (7.8)
Pretty much afraid	1 (0.9)	1 (0.9)	0 (0)
Very much afraid	14 (12.2)	18 (15.7)	13 (11.3)
The sight of the dentist drilling			
No fear	86 (74.8)	75 (65.2)	85 (73.9)

Very little	11 (9.6)	15 (13.0)	13 (11,3)
Fear	3 (2.6)	10 (8.7)	8 (7.0)
Pretty much afraid	1 (0.9)	0 (0)	0 (0)
Very much afraid	14 (12.2)	15 (13.0)	9 (7.8)
The noise of the dentist drilling			
No fear	70 (60.9)	69 (60.0)	92 (80.0)
Very little	20 (17.4)	22 (19.1)	12 (10.4)
Fear	6 (5.2)	8 (7.0)	4 (3.5)
Pretty much afraid	1 (0.9)	1 (0.9)	0 (0)
Very much afraid	18 (15.7)	15 (13.0)	7 (6.1)
Having someone put instruments into your mouth			
No fear	77 (67.0)	73 (63.5)	96 (83.5)
Very little	24 (20.9)	24 (20.9)	6 (5.2)
Fear	6 (5.2)	6 (5.2)	7 (6.1)
Pretty much afraid	3 (2.6)	1 (0.9)	0 (0)
Very much afraid	5 (4.3)	11 (9.6)	6 (5.2)
Choking			
No fear	43 (37.4)	47 (40.9)	35 (30.4)
Very little	35 (30.4)	25 (21.7)	17 (14.8)
Fear	10 (8.7)	14 (12.2)	22 (19.1)
Pretty much afraid	4 (3.5)	1 (0.9)	1 (0.9)
Very much afraid	23 (20.0)	28 (24.3)	40 (34.8)
Having to go to the hospital			
No fear	79 (68.7)	66 (57.4)	71 (61.7)
Very little	20 (17.4)	22 (19.1)	11 (9.6)
Fear	5 (4.3)	7 (6.1)	18 (15.7)
Pretty much afraid	1 (0.9)	3 (2.6)	0 (0)
Very much afraid	10 (8.7)	17 (14.8)	15 (13.0)
People in white uniforms			
No fear	113 (98.3)	101 (87.8)	105 (91.3)
Very little	2 (1.7)	7 (6.1)	5 (4.3)
Fear	0 (0)	4 (3.5)	2 (1.7)
Pretty much afraid	0 (0)	0 (0)	0 (0)
Very much afraid	0 (0)	3 (2.6)	3 (2.6)
Having the dentist clean your teeth			
No fear	102 (88.7)	93 (80.9)	104 (90.4)
Very little	9 (7.8)	8 (7.0)	7 (6.1)
Fear	1 (0.9)	5 (4.3)	2 (1.7)
Pretty much afraid	0 (0)	1 (0.9)	0 (0)
Very much afraid	3 (2.6)	8 (7.0)	2 (1.7)

From the data collected through the VPT, it could be observed that 74 (64.3%) children were happy, 26 (22.6%) neutral, five (4.3%) scared, four (3.5%) sad, four (3.5%) wanted to cry, and two (1.7%) were angry.

A relationship was found between the cry of caregivers and their children's cry during the dental treatment. However, no relation was found between the caregiver's own dental fear and anxiety and their perception of their children's fear and anxiety, as it is shown in Table 1. In addition, no associations were found between the two groups concerning the facility of having someone examine their mouth, carrying out dental treatment, and tension/ fear during the dental treatment and anesthesia.

The answers of the CFSS-DS were divided into three groups: A1-concerning caregivers, A2-concerning caregivers' perceptions of their children and A3-concerning children's own answers. This questionnaire obtained the following average scores: A1=24.6 (SD ± 8.8%), A2=27.7 (SD ± 11.5%) and A3=26.0 (SD ± 7.6%).

When using the value of 38 as the cutoff point to classify the subject with fear and anxiety, it could be observed that 14 (12.2%) caregivers in A1 group, 20 (17.4%) children (according to caregivers) in A2 group, and 10 children (8.7%) in A3 group presented these characteristics [26].

When assessing the correlation of fear/anxiety scores between A1 and A2 groups, A1 and A3, A2 and A3, a

significant correlation was found between A2 and A3 ($r=0.409$, $p<0.001$). However, the low r value ($r=0.409$/ $r^2=0.167$ [demonstrating an impact of 16.7% between variables]) suggests that this relationship is not very strong and that many other factors must be considered to explain these findings.

When comparing the scores of A1 and A2, A2 and A3, A1 and A3 using the paired t-test, it was observed a statistically significant difference only between A1 and A2 ($p=0.018$). This shows that, in general, guardians do not tend to project onto their children their fears and anxieties, but they tend to correctly predict the fears and anxieties of their children.

The relationship of the degree of fear of doctors and dentists in A1, A2 and A3 was assessed using the paired t-test. There was statistical difference only within A1 group ($p<0.001$), indicating that this population presents a greater fear of dentists rather than doctors. As to Kappa test for the level of fear/anxiety concerning doctors and dentists in groups A1, A2 and A3, there was agreement between groups A1 and A2 (kappa=0.133 and $p=0.19$ for dentists, and kappa=0.19 and $p<0.001$ for doctors). There was also agreement between the A2 and A3 groups regarding fear of dentists (Kappa=0.285 and $p<0.001$).

No relationship was observed between age and fear (Pearson's correlation test $p=0.558$ and $r=0.055$) or between the scores of fear and anxiety (A2 and A3) and the child's gender (independent t test $p>0.05$).

Discussion

This study aimed to understand the relationship of caregivers' performance in the process of producing children's fear and anxiety during dental treatment, helping professionals understand how this relationship takes place and contributing to the development of techniques aimed at reducing or modulating in advance the stress associated with the dental environment.

The levels of anxiety during dental treatment in both children (8.7%) and caregivers (12.2%) obtained through the CFSS-DS are close to the values found by other authors [10,21]. These results show that circa 10% of the population has anxiety and or fear of dental treatment, which may cause impact on public health [26]. This value is important and reinforces the need for studies to examine issues related to this phenomenon, showing the representativeness of the population assessed.

On our study, a relationship was found between the level of children's anxiety/fear from the caregivers' perspective and the level of fear/anxiety self-reported by the children, it is observed that the caregivers can predict the degree of fear and anxiety of their children appropriately. This relationship can be explained in many ways, including the age of the children in the sample (mean 7.9/SD ± 1.7 years). At this age, children have greater capacity to verbalize and therefore express themselves clearly, showing their caregivers – with whom they live most of the time and tend to trust more-their real feelings [27].

The caregivers' prediction of the degree of children's anxiety and fear may be useful as pre-consultation information. If the dentist knows, for example, that the child he will meet is anxious and/or fearful, he may use a more appropriate approach according to the child's needs, including the use of anxiolytic tools during the treatment. These techniques can range from non-pharmacological methods (e.g. childhood conditioning, music therapy, hypnodontics, etc.) to pharmacological methods (e.g. sedation) [8,3,28].

It is interesting to note, however, that some of the caregiver's behaviors during dental treatment seem to be reproduced by their children-for instance, the relationship between the caregiver's cry during their dental treatment and the child's cry during the same treatment. Knowing that the guardian plays a reference role for children in various aspects of life (e.g. imitating the adult to start talking, socializing, etc.), one can say that the adult's cry during situations of fear/anxiety that can occur inside and outside the dental office may influence the reaction of their children when facing fear/anxiety, making them reproduce the same *modus operandi* of their guardians, including during dental treatment [4]. Thus, if a child witnesses his/her caregiver always crying in situations of fear/anxiety, he/she may reproduce this behavior when facing anxiolytic situations.

It was observed that the caregiver' levels of fear and anxiety relating to doctors and dentists are different; the fear of dentists is greater than the fear of doctors. On the other hand, the children's levels of fear and anxiety related to doctors and dentists are similar. This finding is important for demonstrating that the caregivers see doctors and dentists in a different manner and that studies on anxiety should differentiate these two groups of professionals, trying to understand the way the fear and anxiety processes occur for those two groups of professionals. On the other hand, children do not perceive such a difference among the two health professional groups, which allows some extrapolation of this study finding to the medical field.

In this current study, it was decided to apply the VPT before the consultation because at that time the children could be more anxious, and also because when the test is applied after the treatment, it can present more positive results once children could feel more relaxed at this time [19].

The characterization of the profile of the sample showed that of all children, 41 (35.7%) were males and 74 (64.3%) females, with a mean age of 7.9 years. Among the variables that can interfere with dental fear and anxiety in infant patients are age and gender [8,12,16,22]. Some studies have presented significant differences between the average score of fear and age, proving that dental fear decreases with age [7,15,21]. However, this current study

presented no correlation between age and dental fear/anxiety (Pearson correlation test p=0.558), which may be due to the low variability of age among children.

There is no consensus in the literature on the relationship between gender and fear/anxiety of pediatric patients. The studies by Oba et al. [5] found no significant differences in the average scores of dental fear between boys and girls; however, other authors have shown that the level of anxiety in female children is higher than in male children. Authors suggest that girls tend to have a greater ability to express their emotions and thereby, in some circumstances, indicate more fear and anxiety than boys in a dental situation [16,17,21]. However, no relationship was found between fear/anxiety and gender of the children in this study.

The environment of the dental office can raise anxiety and also relate to patterns of operant avoidance and escape behaviors. In addition, dental treatment is seen as an aversive situation for children who do not cooperate [1,2]. Therefore, it is important to incorporate Health Psychology in the training of dentist-surgeons and doctors, making them able to condition children, preventing them from becoming anxious adults who fear medical and dental situations [1,4,6]. Understanding that for this age group there is no distinction between fear/anxiety to dentist and doctors, the findings of this research can well be utilized by pediatricians and other health professions that work with children.

The present study observed, from the perspective of caregivers, a lack of correlation between the level of anxiety/fear self-reported by them and the level of children's anxiety/fear. This lack of relationship implies that, in general, caregivers do not tend to transfer their fears and anxieties onto their children. However, Themessl et al. [18] did a review on the relationship between parental and child dental fear, among the 43 studies investigating the link between parental and child dental anxiety, 34 established a relationship between it. Moreover, on this same review, all studies investigating children under eight years (n=14) reported a significant relationship between parental and child dental fear, however, only one study asked parents to rate their child's anxiety, which is one of the aims of the present study. The reason for this lack of relationship in our study is not clear. It may be due to the context of the dental visit or by the type of measured used. It is known that the degree of association between parental and child dental anxiety may vary depending on the context of the dental visit and the types of measures used [18]. The Children's Fears Survey Schedule Dental Subscale (CFSS-DS) is one of the most used instruments for assessing fear/anxiety among children undergoing dental treatments, and its validity and reproducibility have been proven in various countries and languages [9,10,13,25,29-31]. Unfortunately, the reason for the dental visit was not investigated in the present study, which may be considered a limitation of the study.

Conclusion

This paper present information that support a better understanding of the relationship of caregivers' performance in the process of producing children's fear and anxiety during dental treatment. The evidence showed that caregivers do not transfer their dental fear/anxiety onto their children and that they are able to predict their children's dental fear/anxiety. This information may help professionals in the development of techniques aimed at reducing or modulating in advance the stress associated with the dental environment.

Key Messages

Caregivers do not project their dental fear/anxiety onto their children and that they are able to predict their children's dental fear/anxiety.

This paper present information that support a better understanding of the relationship of caregivers' performance in the process of producing children's fear and anxiety during dental treatment, may help professionals understand how this relationship takes place and contribute to the development of techniques aimed at reducing or modulating in advance the stress associated with the dental environment.

Competing Interests

None of the authors have received, in the last five years, reimbursements, fees, funding, or salary from an organization that may in any way gain or lose financially from the publication of this manuscript. Oswaldo Cruz Foundation, where the co-author APGFVM works, is responsible for this article-processing charge. None of the authors hold or have the intention to hold stocks or shares in an organization that may, in any way, gain or lose financially from the publication of this manuscript. None of the authors hold or is applying for a patent related to the content of this manuscript, nor have received reimbursements, fees, funding or salary from an organization that holds or has applied for patents related to the content of this manuscript. The authors do not have non-financial competing interests (political, personal, religious, ideological, academic, intellectual, commercial or any other) to declare in relation to this manuscript.

Authors Contributions

APGFVM and MVLS were responsible for the conception of the study design. RLS AND DGPM was responsible for data collection and organization. All authors, who were also responsible for the draft of the manuscript, performed data analysis and interpretation. All authors read and approved the final manuscript.

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