The effect of sequential dental visits on dental anxiety levels of paediatric patients



S. Karaca[1], B. Sirinoglu Capan[2]

[1]*Erzincan Binali Yıldırım University, Faculty of Dentistry, Department of Pediatric Dentistry, Erzincan, Turkey*
[2]*Istanbul University-Cerrahpasa, Faculty of Dentistry, Department of Pediatric Dentistry, Istanbul, Turkey*

Email: belens90@hotmail.com

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Abstract

Aim: The aim of the present study is to evaluate the relationship between sequential visits in dental caries treatments and dental anxiety levels of paediatric patients through the use of anxiety scales and physiological measurements.

Study Design: A total of 224 children aged 5–8 years who needed at least two bilateral restorative dental caries treatments of the mandibular first primary molar was included in the study. The treatment duration was approximately 20 minutes and time span between the two appointments was a maximum of two weeks. The Wong-Baker FACES Pain Rating Scale (WBFPS) and The Modified Dental Anxiety Scale (MDAS) were used for subjective measurements and the objective measurement of dental anxiety was performed by measuring the heart rate using a portable pulse oximeter. Statistical analysis was carried out using the Statistical Package for the Social Sciences version 22 (IBM corp. Armonk, NY, USA).

Results: Out of the 224 children, 117 were girls (mean age 6.4 ± 1.1 years) and 107 were boys (mean age 6.1 ± 1.2 years). The mean age of the patients was 6.26 ± 1.147 years, ranging from 5 to 8. There were no statistical significant differences between children's age and genders with dental anxiety. However, there were statistical significant differences for the variables regarding the sequential visits. When comparing the MDAS scores statistically significant differences were observed between the first and second visits ($p<0.001$). Both preoperative and postoperative WBFPS scores were significantly higher at the first visit than at the second visit. Statistically significant differences were observed in the heart rate scores between the treatment sessions ($p<0.001$).

Conclusion: The results of this study show a significant reduction in dental anxiety after sequental dental visits in children aged 5–8 years, which highlights the importance of the sequental visits in paediatric dentistry.

KEYWORDS Dental Anxiety, Children, Sequental Dental Visit, Heart Rate

Introduction

Dental anxiety is defined as the fear of terrible events during dental treatment and the loss of control [Klingberg and Broberg, 2007]. Although this can occur at any age, it usually occurs in childhood or adolescence [Woosung and Amid, 2005]. According to a systemic literature review, the prevalence of dental fear affects 10–20% of the child population worldwide [Cianetti et al., 2017]. In a recent study, the prevalence of dental anxiety in preschoolers, schoolchildren, and adolescents was reported as follows: 36.5%, 25.8% and 13.3%, respectively [Grisolia et al., 2021].

Oral and dental health have an important place in individual and community health. For the body to develop and maintain a healthy life, the teeth in the mouth should be healthy and functional. Fear and anxiety towards dental treatments and dentists are relevant in the application of dental treatments. Despite modern technological applications, going to the dentist is still one of the factors in the development of fear and anxiety reactions. The problem of dental anxiety in childhood can continue in adulthood and may cause avoidance of dental treatment, resulting in negative effects on oral and dental health [Bagchi et al., 2017].

There are many methods to evaluate the level of dental anxiety in children. Examples include various scales used to examine and evaluate the child's behaviour during the visit to the dentist (Frankl Behaviour Scale), psychometric techniques (Spielberg Continuity and Instant Anxiety Scale, the Dental Subscale of the Children's Fear Survey Schedule, modified Yale preoperative anxiety scale, Wong-Baker FACES Pain Rating Scale, Corah Dental Anxiety Scale), physiological measurements (heart rate, nasal skin temperature galvanic skin reflex) and projective tests. The validity and reliability of these methods have been established by previous studies across a wide range of population-based research [Humphris et al., 1995; Rodrigues and Damle, 1997; Lyons, 2009; Cademartori et al., 2017].

Anxiety may be linked to the patient's adaptation to external factors in the environment, so thestimuli in the dental environment may affect the paediatric patient's level of anxiety. There may be a relationship between sequential dental treatments and patient's adherence to the treated clinic and anxiety status.

The aim of this study was to evaluate the relationship between sequential visits in dental treatments and dental anxiety levels of paediatric patients through the use of anxiety scales and physiological measurements.

Methods

Study group

This randomised, crossover clinical study was conducted at the paediatric dental clinic in Erzincan, Turkey. Approval was obtained from the Research Ethics Committee, Erzincan Binali Yıldırım University with ethics number 05/11 on 29/04/2020. A total of 224 children aged 5–8 years who needed at least two restorative dental treatments of the mandibular first primary molar were included in the study.

Other inclusion criteria were: children with no mental disorders, with no past dental experience, hospitalisations or invasive medical treatments and no pain or symptoms associated with their oral health. All included children and parents had to be able to speak and understand the Turkish language. Patients

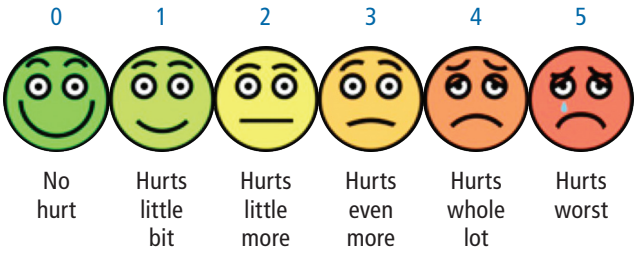


FIG 1 Wong-Baker FACES Pain Rating Scale

Can you tell us how anxious you get, if at all, with each dental visit?

PLEASE INDICATE BY INSERTING 'X' IN THE APPROPRIATE BOX

1.	If you went to your Dentist for TREATMENT TOMORROW, how would you feel?				
	Not Anxious ☐	Slightly Anxious ☐	Fairly Anxious ☐	Very Anxious ☐	Extremely Anxious ☐
2.	If you were sitting in the WAITING ROOM (waiting for treatment), how would you feel?				
	Not Anxious ☐	Slightly Anxious ☐	Fairly Anxious ☐	Very Anxious ☐	Extremely Anxious ☐
3.	If you were about to have a TOOTH DRILLED, how would you feel?				
	Not Anxious ☐	Slightly Anxious ☐	Fairly Anxious ☐	Very Anxious ☐	Extremely Anxious ☐
4.	If you were about to have your TEETH SCALED AND POLISHED, how would you feel?				
	Not Anxious ☐	Slightly Anxious ☐	Fairly Anxious ☐	Very Anxious ☐	Extremely Anxious ☐
5.	If you were about to have a LOCAL ANAESTHETIC INJECTION in your gum, above an upper back tooth, how would you feel?				
	Not Anxious ☐	Slightly Anxious ☐	Fairly Anxious ☐	Very Anxious ☐	Extremely Anxious ☐

Instructions for scoring (remove this section below before copying for use with patients)

The Modified Dental Anxiety Scale. Each item scored as follows:

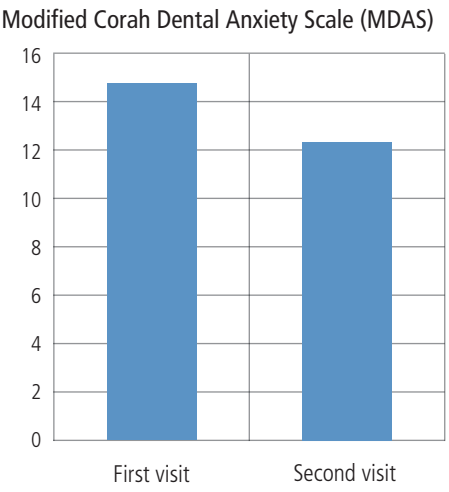
Not anxious	=	1
Slightly anxious	=	2
Fairly anxious	=	3
Very anxious	=	4
Extremely anxious	=	5

Total score is a sum of all five items, range 5 to 25: Cut off is 19 or above which indicates a highly dentally anxious patient, possibly dentally phobic.

**Longman LP, Robert S. Management of dental anxiety. Vital 2010;7(4):22-25.*

FIG 2 Modified Dental Anxiety Scale (MDAS)

FIG 3 MDAS levels of the children in the first and second visits



with chronic systemic illnesses which may affect blood pressure or heart rate were excluded from the study. Only children who required multiple-visit treatments were taken into consideration.

This study was conducted from June 1 to September 1 2020 among 246 paediatric patients who visited the paediatric dental clinic for the first time and met the inclusion criteria. Patients were randomly selected and invited to participate in the study. Because of the absence of 22 patients at the second visit, the final sample was 224 children of both genders, aged 5–8 years old.

Procedure

All treatment sessions were held in the morning by the same paediatric dentist (SK). After application of a topical anaesthetic gel, the local anaesthetic injections were performed with a dental anesthetic syringe (CitojectStainless Steel; Heraeus Kulzer, Hanau, Germany). The treatment duration was approximately 20 minutes. The treatments included bilateral restorative treatment of the mandibular primary first molars. Behaviour management techniques, such as Tell–Show-Do, voice control and modeling were used during dental treatments for all patients. Treatment that required multiple visits necessitated the patients for a minimum of two visits with parental presence. The interval between the two appointments was a maximum of two weeks and the duration of the study was 3 months.

Data Collection

In each session the Wong-Baker FACES Pain Rating Scale (WBFPS) was used to evaluate dental anxiety before and after treatment. This scale is composed of six faces ranging from relaxed to very worried and scores from 0 to 10 (Figure 1). WBFPS was administered to the children by the paediatric dentist in the waiting room before and after the treatment for both visits.

The 8-item Modified Children Dental Anxiety Scale (MCDAS) and the 15-item Children's Fear Survey Schedule - Dental Subscale (CFSS-DS) are the psychometric tools most frequently used with children. The Modified Child Dental Anxiety Scale (MCDAS), created by Wong et al. [1998] is to be used with 8- to 15-year-old children. This scale, which includes eight items to measure anxiety in various dental circumstances, is based on the Corah Dental Anxiety Scale (CDAS) [Leko et al.,2020].

Validity and reproducibility tests have been conducted on the CFSS-DS and MCDAS in English. As a result, they have been translated into other languages and studied in numerous nations, such as China and Italy, with generally positive reports regarding their validity and reproducibility [Ma et. Al, 2015; Paglia et al.,2017]. The development and expression of children's anxiety may be influenced by cultural and social norms of behaviour, hence the requirement of data particular to each population. Since the MCDAS scale is not suitable for the assessment of dental anxiety in very young children with poor cognitive functions, and there is no validation of the MCDAS score in Turkey, the Modified Corah's Dental Anxiety Scale (MDAS) score, which was validated in Turkey, was used in our study. MDAS is one of the most used

TABLE 1 Mean scores and standard deviations of the variables regarding to the first and second visits

	First visit	Second visit	*p* value
	Mean ± SD	Mean ± SD	
Modified Corah Dental Anxiety Scale (MDAS)	15.1 ± 4.35	12.2 ± 3.55	0.0001
Wong-Baker FACES Scale Preoperative Scores	6.97 ± 1.00	5.58 ± 0.96	0.0001
Wong-Baker FACES Scale Postoperative Scores	5.54 ± 2.16	3.17 ± 1.51	0.0001
Heart rate scores after 5 min	90.7 ± 4.32	87.0 ± 3.95	0.0001
Heart rate scores after 10 min	95.3 ± 4.16	90.8 ± 3.68	0.0001
Heart rate scores after 15 min	100.3 ± 4.63	94.9 ± 3.49	0.0001
Heart rate scores after 20 min	98.6 ± 4.82	92.9 ± 3.13	0.0001

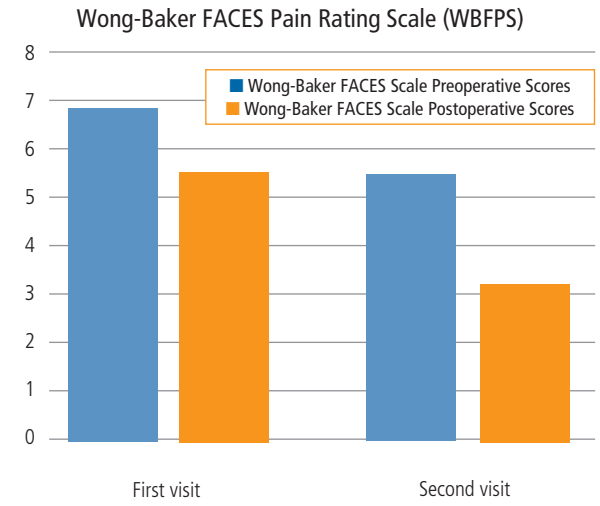


FIG 4 Wong-Baker FACES Pain Rating Scale (WBFPS) scores for both visits

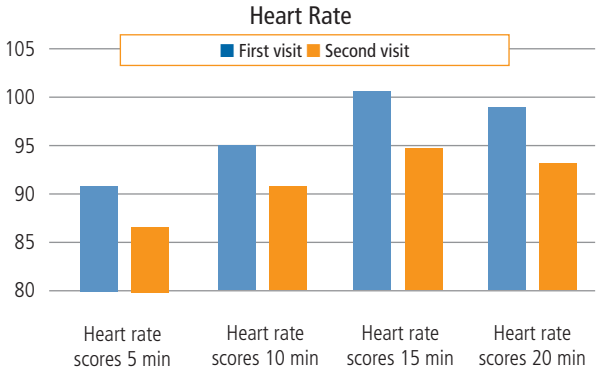


FIG 5 Heart rate of the children during the treatment sessions

dental anxiety measurement methods because of its reliability and validity. MDAS was originally developed by Corah in 1969 and modified by Humphris et al. in 1995. It consists of 5 elective questions. Each question in this scale has 5 answers. The scale yields a score of 5 to 25 and a score ≥ 15, indicates that the child has anxiety (Figure 2). All the children were asked to fill out the MDAS in the waiting room before each treatment session. The Turkish validity and reliability study for MDAS was conducted in 2005 [Tunc et al., 2005].

Measurement of heart rate was a simple and reliable objective method for assessing the dental anxiety of the patients. A portable finger pulse oximeter (Nelcor™ PMN10, Meditronic Corp. MN, USA) was used for this purpose as it is convenient, small, and acceptable for children. The heart rate scores were recorded every 5 minutes during the dental treatment.

Statistical Analysis

All data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 22 data processing software (IBM corp, Armonk NY, USA). To exclude all differences between the groups, the independent sample T-test was used, while for differences in behaviour and anxiety scores between the groups the Mann Whitney U test was used. The level of statistical significance was set at $p<0.05$.

Results

Out of the 224 children, 117 were girls (mean age 6.4 ± 1.1 years) and 107 were boys (mean age 6.1 ± 1.2 years). The mean age of the patients was 6.26 ± 1.147 years, ranging 5–8 years of age. There were no statistically significant differences between children's age and genders regarding dental anxiety ($p>0.05$).

Table 1 shows the means and standard deviations of the variables for the first and second sessions in this study. There were statistically significant differences for the variables regarding sequential visits. While the mean MDAS score was 15.1 ± 4.35 at the first visit, it was 12.2 ± 3.55 at the second visit. Comparison of the MDAS scores highlighted statistically significant differences between the first and second visits ($p<0.001$). Table 1 shows that the mean MDAS score of the patients in the first visit was statistically higher than the mean MDAS score of the patients in the second visit (Figure 3).

The Wong Baker face scale (WBFPS) was used for determining the dental anxiety of the children before and after the treatments in both sessions. The preoperative WBFPS score was 6.97 ± 1.00 at the first visit and 5.58 ± 0.96 in the second visit. Postoperative scores were 5.54 ± 2.16 and 3.17 ± 1.51 at the first and second visits, respectively. Statistically significant correlations were found in the preoperative and postoperative WBFPS ratings between the first and second treatment visits ($p<0.001$) (Table 1) (Figure 4).

The heart rate levels were assessed at different times during the treatments for evaluating the dental anxiety of the children. Table 1 shows the mean and standard deviation (SD) for heart rate scores for each stage of both visits. The mean heart rate scores at the first visit were 90.7 ± 4.32, 95.3 ± 4.16, 100.3 ± 4.63, and 98.6 ± 4.82 after 5, 10, 15 and 20 minutes, respectively. At the second visit, these values were 87.0 ± 3.95, 90.8 ± 3.68, 94.9 ± 3.49, and 92.9 ± 3.13 respectively. It can be seen that there were statistically significant differences in the heart rate scores between the treatment sessions ($p<0.001$) (Table 1) (Figure 5).

Discussion

Investigating the effect of sequential dental sessions on dental anxiety of the children over a 3-month period was the main objective of this research. This study highlights how acquired experiences and the familiarisation of a child with the dental environment can impact the dental anxiety of the peadiatric patients during multiple dental treatment visits. Additionally, the choice of objective and subjective measurement tools to assess dental anxiety is another important aspect of this study.

A new environment with enough "instruments of pain" produces anxiety in children, which in turn causes changes in the heart rate. The difference in the heart rate of the child from the first to the second visit to the dental clinic is probably due to fear of unknown in the first visit and the familiarisation with dental environment in the next one. When heart rate changes are taken into consideration in this study, the results show a significant difference in most of the children from the first to the second visit. Bagchi et al. [2017] mentioned that there was a significant reduction in the heart rate of children in the subsequent visits. Our results reinforce the fact that multiple visits can reduce the dental anxiety of paediatric patients, which is in line with the findings of previous studies [Menezes Abreu et al., 2011; Baghci et al., 2017].

Subjective measures can be used as an alternative to objective physiological measurements. One of the most used visual scales is The Wong-Baker FACES Pain Rating Scale. It is a pictorial test designed to evaluate the self-reported level of dental anxiety in children [Guinot Jimeno et al., 2014; Mendoza-Mendoza et al., 2015]. The results in this study for the WBFPS show a significant difference between the first and second visits. A decrease in the

scores of dental anxiety was detected after the second treatment visit, which may be related to increased familiarity with the dental environment and the dental procedures. The results of this study are also consistent with the findings of Menezes Abreu et al. [2011] who reported that the subsequental dental visits causes a decrease in the level of dental anxiety of children.

In contrast, the results of this study are inconsistent with the findings of Venham et al. [1977] and Cademartori et al. [2017] who mentioned increasing scores in children's dental anxiety after multiple visits. This difference may be related to the different measurement instruments used – Venham Picture Test, Frankl Scale instead of WBFPS – and also by the different nature of the dental visits.

In this study, MDAS was preferred because it is an easy and reliable method. There are significant differences in the results of MDAS scores in the present study. The anxiety levels show a significant decrease in the sequential dental treatments. These results are consistent with the findings of previous studies in the literature [Rayen et al., 2006; Menezes Abreu et al., 2011; Bagchi et al., 2017; Subramaniam et al., 2020].

There was no significant difference between genders and ages in this study. The same pattern of anxiety was found in males and females and in all different age groups from the first visit to the second visit. These outcomes are consistent with the findings of Rodrigues and Damle [1997], Rayen et al. [2006] and Fux-Noy et al. [2022].

Behaviour management techniques in paediatric dentistry aim to reduce the fear and anxiety of the patient, promote a permanent behaviour change in the patient, receive positive feedback and provide quality dentistry services [Kuscu and Akyuz, 2008]. The relationship between the dentist and the child is a dynamic event created with dialogue, facial expression and tone of voice. With this relationship, the fear and anxiety in the child can be reduced, the child can be taught to cope with these emotions and become self-confident [Shim et al., 2015]. There are also behavioural management techniques, like virtual reality applications or videos, that can be adopted even before the first visit to facilitate familiarisation towards the dental office and anxiety reduction, currently used for children with special needs [Pagano et al., 2022]. Paediatric dentists should select appropriate behaviour management techniques to minimise dental anxiety of the child [Subramaniam et al., 2020]. In our study the dental treatments of the peadiatric patients were performed by a paediatric dentist, who used behaviour management techniques during all treatment sessions. This may be a reason for the reduction in levels of the children's dental anxiety in these sequential dental visits.

Study Limitations

One of the limitations of this study is that the data obtained with WBFPS scale is not reliable enough, since this scale is a self-reporting measurement technique. In addition, before the WBFPS was used in this study, no validity and reliability study was conducted in the Turkish population. Another limitation of the study is that the patients participating were only from a certain region, and the results may vary in populations with participation from different regions or different countries.

Conclusion

The results of this study show a significant reduction in dental anxiety after sequental dental visits in children aged 5–8 years. This study highlights the importance of sequental visits in paediatric dentistry for the reduction of dental anxiety in children during care, even in children who have already familiarised with the dental environment.

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