

## *The use of audiovisual distraction eyeglasses as a resource in Pediatric dental care: a case series*

### *Uso dos óculos audiovisuais como recurso de distração na clínica de Odontopediatria: série de casos*

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#### **ABSTRACT**

**Objective:** This study aimed to report a case series on the use of audiovisual distraction eyeglasses in children during dental care. **Methods:** The influence of the distraction tool on the children's heart rate frequency and dental care experience was further investigated. The study children had their heart rate recorded during three clinical appointments and underwent the following procedures: 1) anamnesis; 2) modified atraumatic restorative treatment with the child wearing audiovisual eyeglasses; and 3) modified atraumatic restorative treatment without the use of audiovisual eyeglasses. The interval between appointments was up to one week. The heart rate was measured using a pulse oximeter, and a post-treatment questionnaire was applied after the three appointments. The sample consisted of five children aged 4 to 7 years attending the Pediatric Dental Clinics of the State University of Paraíba. **Results:** While wearing the audiovisual eyeglasses, the children's individual heart rates were lower in the second dental visit as compared to the first and third ones. The post-treatment questionnaire revealed a preference for the use of audiovisual distraction eyeglasses as the children felt more comfortable, pleased, and had a reduced pain perception and anxiety. **Conclusion:** The heart rate decrease observed herein suggests that audiovisual eyeglasses may contribute to reducing anxiety during dental care.

**Indexing terms:** Audiovisual Aids. Handling. Pediatric Dentistry.

#### **RESUMO**

**Objetivo:** Relatar uma série de casos sobre o uso dos óculos audiovisuais em crianças durante o atendimento odontológico, bem como sua interferência na frequência cardíaca e percepção sobre o atendimento. **Métodos:** As crianças foram analisadas em três atendimentos clínicos para registro das frequências cardíacas: 1) realização da anamnese; 2) execução de um tratamento restaurador atraumático modificado (a criança usando os óculos audiovisuais) e 3) execução de um tratamento restaurador atraumático modificado sem a ferramenta de distração. O intervalo entre os atendimentos foi de até uma semana. A frequência cardíaca foi monitorada, por

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meio de um oxímetro de pulso e ao final da etapa dos três atendimentos, um questionário pós-tratamento foi aplicado. A amostra foi constituída por 5 crianças entre 4 e 7 anos de idade, atendidas na clínica de Odontopediatria da Universidade Estadual da Paraíba.

**Resultados:** As frequências cardíacas individuais e as médias intermediárias do segundo atendimento, com os óculos audiovisuais, foram menores em relação ao primeiro e o terceiro; o questionário pós-tratamento revelou uma preferência no uso dos óculos audiovisuais por serem mais confortáveis, agradáveis, e por sentirem menor percepção dolorosa e ansiedade. **Conclusão:** A redução da frequência cardíaca com os óculos audiovisuais sugere a redução da ansiedade durante o atendimento odontológico.

**Termos de indexação:** Recursos audiovisuais. Manejo. Odontopediatria.

## INTRODUCTION

One of the main reasons negatively affecting child dental care is anxiety [1]. Anxiety during dental care is defined as the fear of visiting the dentist for any procedure, whether preventive (less invasive treatment) or not. This condition may prevent the execution of dental procedures [2] and lead to the onset of oral diseases [3].

Dental anxiety is preceded and followed by emotional reactions which are reflected in the presence of vital signs out the normal range [4], such as elevation of blood pressure and heart rate frequency, as well as changes in blood oxygen saturation [5].

The pediatric dentist can use different approaches to control the negative behavior of child patients. Among the available resources are voice control, talk-show-do, hand-over-mouth, positive reinforcement and distraction [6]. Distracting is a relatively simple approach [7] to decrease the excess attention directed to painful stimuli [8], thereby reducing the child's suffering and disturbing behavior associated with dental care [7].

Distraction can be obtained through various mechanisms, including the use of audiovisual eyeglasses. They consist of an innovative technology which creates a virtual environment with the help of a display to distract patients during medical or dental procedures. When the patient is highly immersed in the distracting environment, they no longer focus on the procedure and therefore have less anxiety [9].

As virtual environments allow patients to feel like they are in a different place [9], the use of audiovisual eyeglasses can be an ally to divert the child's attention and reduce dental anxiety [10].

The use of audiovisual eyeglasses during dental treatment can not only improve future experiences in the dentist's office but also interrupt the cycle of experiences associated with negative memories and expectations [11]. In this study, we report a five-case series on the use of audiovisual distraction eyeglasses in children during dental

care. The influence of the distraction tool on the children's heart rate frequency and dental care experience was further investigated.

## METHODS

This was a case series study with children aged 4 to 7 years, of both sexes, assisted in the Pediatric Dental Clinics of the State University of Paraíba - Campus I, in the city of Campina Grande, PB, Brazil. The following eligibility criteria were considered: children with or without previous experience in the dentist's office, with no history of dental anxiety; normal sight and hearing capacities according to their parents/guardians' reports; who had at least two Class I shallow carious lesions in deciduous molars, with approximately 3-mm extension, eligible for the use the modified atraumatic restorative treatment (mATR) technique.

Three 30-minute visits were performed with a one-week interval in between. A complete anamnesis of the child was carried out in the first visit, whereas mATR was performed in the second and third appointments. This modified technique includes the removal of unsupported enamel using diamond drills and manual instruments (e.g., cures) [12].

All children underwent two types of dental care experiences: with and without audiovisual eyeglasses throughout the mATR. Audiovisual eyeglasses were used in the second visit, but not in the third one so that the child could experience both situations during mATR. Audiovisual eyeglasses (Carl ZEISS Cinemizerplus, Oberkochen, Germany) were connected to an iPod (Apple iPodtouch 4th) and the children were allowed to watch their favorite entertainment content. To measure the heart rate frequency, a pulse oximeter (CMS-50QA, Contec Medical System Co. China) was placed on the index finger of the child and monitored throughout dental care.

Three heart rate measurements were obtained in each visit, as follows: at the beginning of the session (first

measurement); during mART, with the use of a rotating instrument (second measurement); and immediately after dental care (third measurement).

After the three appointments were completed, the audiovisual post-treatment questionnaire proposed by Frere et al. [18] was applied. The questionnaire addresses some aspects related to anxiety, discomfort (pain) and duration of the procedure of patients who wore audiovisual eyeglasses during dental care. The questionnaire was adapted in our study for a better verbal organization of the questions to facilitate its understanding by child patients. The adapted questionnaire included six questions, with possible scores from 1 to 7. For data analysis, a score of "4" was considered as neutral in questions 1 to 4, while a score of "1" was considered as neutral in questions 5 to 6.

The clinical procedures were performed by the same dentist, who also carried out all the evaluations and test applications. The dentist was assisted by a dental assistant, whom registered the patient's information into a dental chart.

This study was previously approved by the Research Ethics Committee of the State University of Paraíba via Plataforma Brasil, under protocol no. 1.863.744 / CAAE 62977916.7.0000.5187. Parents and legal guardians were informed about the purpose of the study and signed an informed consent form and a term authorizing the use of photos and videos.

The children who participated in this study were referred to the General Pediatric Clinics of the School of Dentistry at the State University of Paraíba for treatment of other oral conditions.

## RESULTS

Ten children were selected for the study, of which only five attended the three visits (three females and two males), with a mean age of 6.4 years. The mean intermediate heart rates in the first, second and third visits were 104.6 bpm, 93.8 bpm and 104.2 bpm, respectively, with a noticeable decrease in the second appointment. The heart rate measurements of the three visits are described in Table 1.

All individual intermediate heart rate measurements obtained in the second visit were lower than those in the first and third visits, which also led to a decrease in the overall intermediate heart rate.

As shown in table 2, the post-treatment questionnaire revealed that the children felt more comfortable and pleased during dental care with the use of audiovisual eyeglasses than otherwise.

Individual experiences during the dental visits were described as follows:

### Case 1

A 7-year-old female patient with behavioral alterations, such as stress, according to her mother's report. With a quiet aspect, the child did not appear to be stressed out or fearful during the anamnesis. Always alert to the dental instruments, she showed a little mistrust. At the second visit, she was smiling and quiet, however, she seemed a bit apprehensive about the use of audiovisual eyeglasses. After adjusting, she wore the distraction glasses and was responsive to all clinical commands. At the

**Table 1.** Heart rate frequency of child patients in three visits to the dentist under different conditions.

PATIENT	APPOINTMENT #1			APPOINTMENT #2			APPOINTMENT #3		
	Without audiovisual eyeglasses			With audiovisual eyeglasses			Without audiovisual eyeglasses		
	INITIAL	INTERMEDIATE	FINAL	INITIAL	INTERMEDIATE	FINAL	INITIAL	INTERMEDIATE	FINAL
	FC	FC	FC	FC	FC	FC	FC	FC	FC
1	102	93	95	122	87	90	94	110	95
2	101	99	91	89	97	101	105	100	89
3	121	106	103	90	95	92	96	98	91
4	112	118	112	103	90	93	114	105	110
5	105	107	101	94	100	100	116	108	102
MEAN	108.2	104.6	104.4	99.6	93.8	95.2	105	104.2	97.4

**Table 2.** Distribution of the data obtained from the post-treatment questionnaire applied to five child patients.

QUESTION	RESPONSE						
	1	2	3	4	5	6	7
1 - The appointment with the use of audiovisual glasses seems to be...?	Faster			The same		Longer	
	4	0	0	1	0	0	0
2 - Were you more or less anxious during dental care when wearing audiovisual glasses?	Less			The same		More	
	4	1	0	0	0	0	0
3 - How uncomfortable was the use of audiovisual eyeglasses during dental care?	Less			The same		More	
	4	0	1	0	0	0	0
4 - Do you prefer undergoing dental procedures with or without audiovisual eyeglasses?	Without			Indifferent		With	
	0	0	0	0	0	0	5
5 - How pleasant was it for you to watch the video during the consultation?	unpleasant			Moderately pleasant		Very pleasant	
	0	0	0	0	0	1	4
6 - How focused were you on the video?	Barely focused			Moderately focused		Very focused	
	0	0	0	0	0	0	5

end of the visit, she said: "one gets comfortable with the glasses" and she made video suggestions for the third visit. In the third visit, the patient inquired about the possibility of using the distraction glasses again. She consistently showed a confident behavior and felt comfortable before, during and after the use of dental instruments. Her mother reiterated that she [the daughter] was going through a stressful time, but her body expressions, facial aspect and behavior were not compatible with that report. Both the mother and the child reported that after the visits they became more aware of the importance of toothbrushing.

## Case 2

A 7-year-old female patient. In the first visit for anamnesis, she was calm and smiling and did not show any anxiety signs from the moment she came into the office until the end of the consultation. In the second visit, the patient was more familiar with the clinical setting. She was confident since the first moment and well-adjusted with the use of audiovisual eyeglasses. No behavioral change was noticed during most of the appointment. After the procedure was completed, the child removed the glasses by herself, which appeared to be an aversive behavior at a first glance, but then she asked to take the glasses with her and to use them in the following visit. In the third visit, the child did not perform sudden movements or had parallel conversations during the intervention and showed no fear of the high-speed dental handpiece. She interacted all the time and completed the protocol satisfactorily.

## Case 3

A 7-year-old male patient presented with difficulties in verbal communication, responding to simple questions with only head gestures and relying on his father to communicate with the dentist. The first clinical appointment was marked by great difficulty in the child-professional relationship. The child remained with his fists clenched and looked confused during the introduction of the dental instruments during the first visit, which required the professional to have a good clinical management and establish an initial trust relationship.

In the second visit, the child showed the same characteristics upon arrival at the dentist's office. As the dentist assumed that the child could be reluctant to the use of distraction eyeglasses, he provided a detailed conditioning before the introduction of the glasses so that to establish a trust bond during the moments in which sight and hearing senses were partially covered. Differently from the first visit, there was no resistance of the child upon introduction of the dental instruments and high-speed handpiece. The removal of the carious tissue was prolonged, however, there was no opposition or restlessness of the child throughout the procedure. At the end of the visit, the child's body expression and physiognomy were very different from those seen on the first day.

The third visit to the dentist showed a behavioral evolution that was very noticeable and, to some extent, unexpected. Even without the use of distraction eyeglasses, the child allowed the dentist to perform all necessary

procedures uneventfully. There was no change in speech or body expression indicative of anxiety. The commitment to the scales and to the questionnaire, the smile that was absent on the first day, and the mother's report "now, he sticks to the toothbrush and only speaks about the glasses... that he watched a cartoon" are indications that a good conditioning, allied to a technological equipment, can converge to momentary and future clinical success. Ultimately, this approach helps improving the child-dentist relationship while contributing to a better health care.

#### Case 4

A 4-year-old girl patient was presented to the pediatric dental clinics by her mother. The child seemed to be familiar with people and was always interacting. Easy to handle and communicate, she did not offer any resistance to the use of the oximeter nor of the instruments used for clinical examination. The clinical environment was not characterized as a place of stress.

The same enthusiasm of the child was observed during the second visit. Prior to wearing the distraction eyeglasses, she had a high heart rate frequency, but one minute after wearing the glasses, her heart rate frequency was reduced by more than 20 bpm. The adjustment and familiarization prior to the mART caused the child to say: "my eyes are hurting." At that point, the glasses were removed, and it was noticed that she looked sleepy. The glasses were used again, and the procedures started. The child did not mention any more discomfort when asked. The end of the visit was satisfactory and positive.

While at the waiting room prior the third visit, the child said: "Will I have the glasses today with the Luna Show? I liked it very much and I want it again". With excellent behavior, the procedures were performed without signs of anxiety, fear, questions and inappropriate movements. Even at the end of the consultation, the child continued interacting with students and professors in the clinical environment, demonstrating confidence and satisfaction with the end of the treatment.

#### Case 5

A 7-year-old male patient attended the pediatric dental clinics with his mother. He seemed doubtful and unsure of the surrounding place and people. He was

not bothered with the use of the oximeter nor had a negative reaction to the dental instruments. With little communication and smooth movements, he remained with his head down for the first few minutes before the clinical examination, but all procedures underwent well and satisfactorily.

In the second visit, the child was somewhat communicative, but remained silent most of the time, and no longer had his head down during the consultation. Signs of reality immersion with the audiovisual eyeglasses were perceived since the first moments. He did not resist the use of any dental material and instruments during dental care. As the child was responsive to all commands, the visit had a satisfactory progress. Even after being informed about the end of the appointment, the child was highly focused on the glasses and did not ask the dentist to remove them.

The report that the child was more interested in toothbrushing opened the third visit to the dentist. With a calm aspect and apparent absence of anxiety and fear, the child did not present behavioral changes during the course of the whole session. He himself adjusted the oximeter onto his finger. A patient who initially appeared to be difficult to manage completed the treatment with a significant behavioral evolution and great clinical adjustment.

#### DISCUSSION

The first moments of the dental appointment were dedicated to demystifying the anxiety experienced by child patients, particularly among those who had never received dental care. This first contact consisted of the presentation of the dental office and materials as well as of an explanation about the procedures to be carried out during that visit and the reasons to perform them. The children were instructed about caries prevention and oral hygiene. This initial approach mediates the introduction of the patient to the dental environment aimed at behavioral improvements and cooperation during dental care [13]. At this moment, the children chose their favorite cartoon to experience something of their daily life inside the "yet unknown" dental office. This procedure has been shown to increase patient compliance and encourage a better behavior during dental care [14].

The use of audiovisual eyeglasses was preceded by the talk-show-do approach so that the child would not be afraid to be partially isolated from the real world and

would bond with the dentist. The device was used only in the second visit.

Physiological measures, such as heart rate frequency, are reliable parameters to detect systemic alterations [15]. Negative feelings (e.g., fear, anxiety and stress) are responsible for an increase in the pulse rate [16] due to the release of catecholamines as a response of the autonomic nervous system to a potential threat [17].

In our study, the assessment of anxiety and fear was based on the heart rate frequency. The results of our study reinforce the indication of audiovisual distraction eyeglasses during dental care for children aged 4 to 7 years as an aid to reduce anxiety. Children in this age group commonly present negative behaviors during dental procedures, which reaffirms the importance of resources that may contribute to a pleasant experience [7,14]. Individual heart rates at the time of intervention were lower when audiovisual eyeglasses were used. The same results were found in previous studies [14,17-22]. A recent study compared the influence of conventional treatment, audiovisual eyeglasses and audio alone on the patients' heart rates. The authors observed a heart rate increase in all three groups, with no improvements in the physiological measurements of the group that wore the glasses [23]. Here, the relationship between the lack of distraction eyeglasses and the increase in heart rate in the third visit can be explained by the fact that the child feels uncomfortable with the dental handpiece, its noise, and with the feeling that a painful situation can suddenly occur [1]. This suggests that the distraction approach with eyeglasses can be directly linked to a possible reduction in child anxiety.

The following behaviors were observed among children who did not use the audiovisual eyeglasses in the third visit: they asked more questions, moved more often and turned their attention to objects like saliva ejector, light, room temperature, instruments and handpieces. Therefore, the heart rate decrease observed in the second visit may be associated with the use of audiovisual distraction eyeglasses as these reduce the child's sight and hearing perceptions and directly influence the child's distracted behavior.

The post-treatment questionnaire evaluated the perception of children wearing the distraction glasses on procedure length, pain and anxiety, after the last visit. The findings of the post-treatment questionnaire observed in

our study are in line with others reported in the literature [13,23-25].

The appointments were more pleasant and there was a spontaneous preference in using the glasses again in future appointments according to the children's reports. In our study, all patients expected to, and asked for, wearing the glasses in the third visit.

The reports of the children who participated in the study provide evidence of a positive outcome about the use of audiovisual distraction eyeglasses. As there are no contraindications, distraction glasses can be a valuable tool in the daily routine for patients with mild and moderate anxiety undergoing any dental procedure. Similar positive outcomes have also been reported elsewhere [18,26].

With the ability to reduce anxiety, audiovisual distraction eyeglasses may provide a suitable opportunity for a differentiated clinical management. It is a well-accepted tool for use in children, easy to handle, and with no harm effects. Ultimately, the use of audiovisual glasses may improve the quality of the care provided and help prevent future noncompliance and treatment aversion.

The use of audiovisual distraction eyeglasses can be a useful tool in routine dental care, especially for children who have mild to moderate fear and anxiety. However, further studies should focus on more invasive treatments to evaluate the benefits of this resource under conditions associated with a higher level of anxiety.

## CONCLUSION

The use of audiovisual distraction eyeglasses was followed by a decrease in heart rate frequency in children during dental care, which indicates a possible anti-anxiety effect. The post-treatment questionnaire findings indicate a reduction in anxiety and pain, as well as a more pleasant visit and greater focus during dental procedures. Individual reports indicate positive behavioral changes when children wear audiovisual distraction eyeglasses.

## Collaborators

IBS ALVES, study design, study execution, data analysis, data interpretation and manuscript writing. AF GRANVILLE-GARCIA, data analysis and revision of the manuscript. RT FIRMINO, data analysis, data interpretation and manuscript writing. MC GOMES,

data analysis, data interpretation and manuscript writing. EMMB COSTA, study design, study execution, data analysis, data interpretation and manuscript writing.

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