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VISUAL AND TACTILE SELF-PERCEPTION AS A METHOD OF ORAL HEALTH EDUCATION

AUTOPERCEPÇÃO VISUAL E TÁTIL COMO MÉTODO DE EDUCAÇÃO EM SAÚDE BUCAL

Maria Clara Barucci Araujo[1*], Clodoaldo Penha Antoniassi[2], Maria Luiza Barucci Araujo Pires[3], Tânia Harumi Uchida[4], Luíza Sant'Anna Correa de Toledo[5], Mitsue Fujimaki[6]

ABSTRACT: **Aim**: To develop and evaluate the effectiveness of a method of oral health education using tactile and visual self-perception of dental biofilm in children. **Methodology:** This was an experimental and longitudinal study with 13 children aged 8 to 12 years, from two institutions in Maringá, state of Paraná, conducted in two phases with a 3-month interval, incorporating the following activities: a questionnaire on knowledge about dental caries and hygiene habits, self-assessment of biofilm amount using images and a tactile sensory panel, biofilm disclosure, oral hygiene instruction, and supervised brushing. **Results:** There was an improvement in knowledge about dental caries, the use of dental floss, an increase in tooth brushing frequency, and a reduction in the biofilm index after 3 months. **Conclusions:** The stimuli contributed to increase oral knowledge and hygiene, as well as a decrease in the plaque index, demonstrating the effectiveness of the oral health education method.

KEYWORDS: Dental Caries. Dental Plaque. Oral Health.

RESUMO: **Objetivo:** Desenvolver e avaliar a eficácia de um método de educação em saúde bucal, utilizando a autopercepção tátil e visual de crianças sobre o biofilme dental. **Metodologia:** Foi realizado um estudo experimental e longitudinal, com 13 crianças de 8 a 12 anos, de duas instituições de Maringá/PR, em dois momentos, com intervalo de 3 meses, tendo as seguintes atividades: questionário sobre conhecimentos acerca da cárie dentária e hábitos de higiene; autoavaliação da quantidade de biofilme utilizando imagens e painel sensorial tátil; evidenciação do biofilme; instrução de higiene bucal e escovação supervisionada. **Resultados:** Verificou-se melhora nos conhecimentos sobre cárie dentária, uso de fio dental, aumento no número de escovações e redução no índice de biofilme após 3 meses. **Conclusões:** Os estímulos auxiliaram no grau de conhecimento e higiene bucal, além da diminuição do índice de placa, evidenciando a eficácia do método de educação em saúde bucal.

PALAVRAS-CHAVE: Cárie dentária. Placa Dentária. Saúde bucal.

[1]Dentist from the State University of Maringá (UEM) and Resident in Public and Family Health in Dentistry in the Dental Residency Program at the State University of Maringá (UEM), Maringá, Paraná, Brazil; [2]PhD in Integrated Dentistry, Department of Dentistry, State University of Maringá (UEM), Maringá, Paraná, Brazil; [3]Master's and PhD student in Dental Sciences, Araraquara School of Dentistry, São Paulo State University Júlio de Mesquita Filho (Unesp), Araraquara, São Paulo, Brazil; [4]PhD, Department of Dentistry, State University of Maringá (UEM), Maringá, Paraná, Brazil; [5]Dentist from the State University of Londrina (UEL) and Resident in Public and Family Health in Dentistry in the Dental Residency Program at the State University of Maringá, Maringá, Paraná, Brazil; [6]PhD in Cariology from the State University of Campinas (2004). Associate Professor of the Department of Dentistry at the State University of Maringá, in the area of Public Health. Maringá, Paraná, Brazil.

***Corresponding author**: Maria Clara Barucci Araujo – *Email*: mcbarucci1007@gmail.com.

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INTRODUCTION

Dental caries is a dynamic multifactorial disease, determined by behavioral, biological, and psychosocial factors, closely linked to sugar consumption and mediated by biofilm, which leads to an imbalance between the demineralization and remineralization of dental tissues[1,2], affecting more than 52 million Brazilians over 6 years of age[3].

Dental biofilm consists of a mass adhered to tooth surfaces, composed of non-calcified polysaccharides and salivary glycoproteins. The main way to break down biofilm is through brushing, essential for maintaining oral health[5]. Knowing the role of dental biofilm in tooth decay, indices have been developed to classify the amount of biofilm present on tooth surfaces[6]. Among them, the Simplified Oral Hygiene Index (OHI-S) by Greene & Vermillion uses the amount of plaque visualized on the enamel surface of index teeth, after using a plaque-disclosing agent, classifying each tooth from 0 to 3[7].

Effective prevention and control of dental caries require a comprehensive understanding of the risk factors, underlying mechanisms, effective intervention strategies, and a continuous search for innovative methods and personalized preventive approaches. In this context, educational programs are crucial in empowering individuals to adopt a proactive approach to their oral health. Combining these programs with regular visits to the dentist further strengthens the preventive approach[8].

The World Health Organization's (WHO) global strategy has emphasized the prevention and control of noncommunicable diseases, as well as improving interventions that affect the environmental, economic, social, and behavioral determinants of chronic diseases[9]. Interventions aimed at promoting oral health focus primarily on maintaining dental health, reducing the need for emergency dental treatment[1].

Oral health promotion involves a set of practices that aim to improve the quality of life of the population, through strategies that go beyond the treatment of diseases. Oral health education has been recognized as a fundamental principle of health services for several years and has proven effective in many countries, both developed and developing[11], as a way to develop oral hygiene habits in school-age children (5-14 years)[12].

Considering that in the school-age group, there is an awakening of curiosity and the desire to repeat what they have learned, working on the prevention and promotion of oral health on a scale that is visible to children is a tool that can assist health professionals in the educational process for the adoption of favorable habits, directly impacting the quality of life of these individuals[13]. For this purpose, some approaches are carried out by professionals in the oral health area, such as lectures, the creation of informative posters, the use of audiovisual resources, such as videos and audio, and recreational-educational activities[14,15].

Furthermore, developing sensitivity to self-perception of the presence of biofilm is a necessary skill for individuals to acquire and maintain good oral hygiene habits from childhood, ensuring their autonomy for self-care throughout life. However, few findings in the literature evaluate self-perception as an instrument for oral health education in different populations and age groups.

Given the above, the present study aimed to develop and evaluate the effectiveness of a method of oral health education, using the tactile and visual self-perception of school-age children (8 to 12 years old) regarding their biofilm index and, with this, stimulate understanding about the need for adequate oral hygiene and the adoption of healthy habits in daily life.

METHODOLOGY

STUDY DESIGN

This was a longitudinal experimental study with 13 school-aged children (8 to 12 years old) from two institutions that provide care for families and children in socially vulnerable situations, lasting 3 months, in Maringá, state of Paraná. Quantitative data were collected from dental biofilm indices, and knowledge about oral hygiene and caries was assessed through interviews.

The method of oral health education consisted of an intervention with an approach based on visual and tactile self-perception, in 5 steps. To this end, a questionnaire was developed about oral hygiene and knowledge about dental caries. A tactile sensory macromodel was built and images were printed, which addressed the presence of dental biofilm, followed by biofilm disclosure using fuchsin. Subsequently, children received guidance on oral hygiene and diet, as well as supervised brushing.

In a similar approach to the "tell-show-do" technique[16], the process began with explaining the theory and using a questionnaire to address any questions (TELL). This is followed by sensory understanding using the tactile sensory panels, images, and self-reported oral health condition, along with the disclosure of bacterial plaque, thus allowing exploration and comparison with the clinically determined individual oral health condition (SHOW). Finally, the participants practiced tooth brushing and flossing (DO), emphasizing the importance of oral hygiene.

RESEARCH PARTICIPANTS

The sample included children from two institutions in Maringá, state of Paraná. These institutions serve socially vulnerable children, regardless of gender, who performed their own oral hygiene but had deficiencies in this area and were present on the dates of data collection. The exclusion criteria were: children with some physical or mental disability and children with serious diseases or syndromes. The total sample universe was made up of 13 children and all were included in the research, thus being considered a convenience sample of children attending these institutions at the time of data collection.

The study was submitted to the Human Research Ethics Committee of the State University of Maringá, following the guidelines and regulatory standards for research involving human beings (Resolution 466/2012 of the National Health Council), and was approved under CAAE: 58660222.7.0000.0104 and opinion number: 5.930.417. All participants were contacted personally and included in the sample after minors signed the Informed Assent and the parents or legal guardians signed the Informed Consent. Participation was voluntary and participants and/or legal guardians could withdraw authorization at any time during the research.

DATA COLLECTION

The method of oral health education consisted of an approach based on visual and tactile self-perception using images and a sensory macromodel, which addressed the presence of dental biofilm, followed by biofilm disclosure using, guidance on oral hygiene and diet, and supervised brushing, as previously described (subtopic Study Design). The interventions were carried out in 2 moments (1st intervention, t0, and 2nd intervention, t1), with a 90-day interval. Each intervention consisted of 5 steps

(E1, E2, E3, E4, and E5), as described below. All steps in both interventions were carried out by the same evaluator.

After each step, the children were asked about their perception of the biofilm in response to the stimulus, allowing each one to freely report their perceptions, feelings, difficulties, and discoveries.

STEP 1 (E1)

Initially, the children were individually interviewed, in a playful manner, using macromodels and images to assess their knowledge of tooth decay, oral hygiene, and dental biofilm (Box 1).

Box 1. Questionnaire applied in Step 1(E1)

QUESTIONNAIRE	ANSWER
1-Do you know what tooth decay is?	Yes or No
2-Is tooth decay related to eating sweets?	Yes or No
3-How many times a day do you brush your teeth?	
4-Do you know what dental floss is?	Yes or No
5-Do you use dental floss every day?	Yes or No
6-Do you think your mouth is healthy and clean?	Yes or No

Source: Prepared by the authors.

STEP 2 (E2)

The second stage consisted of tactile stimulation on a sensory panel simulating biofilm development, made of cardboard and ethylene-vinyl acetate (EVA). Then, they were asked to use their tongue to feel the vestibular and lingual surfaces of the teeth in order to identify any roughness and irregularities that could indicate the presence of biofilm. The children were then asked to identify which classification they believed they fit into, based on the different degrees of biofilm represented on the sensory panel. These degrees were consistent with the classification 0, 1, 2, or 3 of Greene & Vermillion[7].

STEP 3 (E3)

In the third step, with the display of printed images of disclosed biofilm on teeth, representing conditions 0, 1, 2, or 3 of the OHI-S and with the aid of a hand mirror, the children were asked again about their situation, pointing between the images, stimulating their self-perception.

STEP 4 (E4)

Dental biofilm was disclosed using 1% basic fuchsin dye, applied with cotton swabs to all teeth, on the vestibular and lingual surfaces. Each child was classified based on the Simplified Oral Hygiene Index, using the index teeth [vestibular surfaces of the teeth: upper right central incisor (11), lower left

central incisor (31), and upper right (16) and left (26) first molars; and lingual surfaces of the teeth: lower right (36) and left (46) first molars]. The child's response was then compared to the actual classification of the surface, and this comparison was shown to the child.

STEP 5 (E5)

Finally, we provided instructions on oral hygiene. This included teaching how to floss on the interproximal surfaces and supervised brushing, using the Fones technique. This technique involves circular movements of the brush on the vestibular surfaces, back and forth on the occlusal surfaces, and sweeping on the lingual/palatal surfaces. It also included brushing the tongue with a sweeping movement, with fluoridated toothpaste in a pea-sized amount, in order to remove all disclosed dental biofilm and promote good oral hygiene habits.

DATA ANALYSIS

The variables sex, age, and responses collected in Step 1, in both interventions, were analyzed using frequency.

After assessing the normal distribution of the data and the homoscedasticity of Steps 2, 3, and 4, a Paired Student's t-test was applied to identify differences between the two interventions, adopting a significance level of 5%.

RESULTS

Among the participants of the study, 5 were girls (38%) and 8 were boys (62%). Their ages ranged from 8 to 12 years, with an arithmetic mean of 9.9, with 2 children aged 8 years (15%), 3 children aged 9 years (23%), 4 children aged 10 years (31%), 2 children aged 11 years (15%) and 2 children aged 12 years (15%).

Initially, the children's knowledge about tooth decay and oral hygiene, use of dental floss, frequency of tooth brushing, and whether they believed their mouths were clean and healthy were evaluated. When E1 was assessed, comparing the two interventions, there was an increase in knowledge about what tooth decay is and its relationship with the consumption of sweets, dental floss, and frequency of daily tooth brushing (Table 1).

Table 1. Results of the questionnaire applied in Step 1 of the 1st and 2nd interventions.

Questions	1st Intervention		2nd Intervention	
	Yes	**No**	**Yes**	**No**
1- Do you know what tooth decay is?	9 (69%)	4 (31%)	12 (92%)	1 (8%)
2- Is tooth decay related to eating sweets?	9 (69%)	4 (31%)	12 (92%)	1 (8%)
3- Do you know what dental floss is?	10(77%)	3 (23%)	13 (100%)	0
4- Do you use dental floss every day?	1 (8%)	12 (92%)	1 (8%)	12 (92%)
5- Do you think your mouth is healthy and clean?	1 (8%)	12 (92%)	2 (15%)	11 (85%)
6- How many times a day do you brush your teeth?	Once a day: 5 (38%) Twice a day: 4 (31%) 3 times per day: 2 (15%) 4 times per day: 1 (8%) Do not brush every day: 1 (8%) **Mean: 1.76**		Once a day: 3 (23%) Twice a day: 5 (39%) 3 times per day: 3 (23%) 4 times per day: 2 (15%) Do not brush every day: 0 **Mean: 2.30**	

Source: Prepared by the authors.

The results of E2, E3, and E4 showed a similarity between the visual and tactile stimuli compared with the OHI-S, in both interventions, as listed in Table 2.

Table 2. Means and standard deviations of the OHI-S after steps 2, 3, and 4.

	1st Intervention	**2nd Intervention**
Visual with disclosure	1.46 ±0.78 (0-3)	1.69 ±0.75 (1-3)
Tactile	1.46 ±0.96 (0-3)	1.31 ±0.85 (0-3)
OHI-S	1.94±0.62 (0.83-2.83)	1.49 ±0.39 (0.83-2.33)

Source: Prepared by the authors.

Furthermore, when comparing the two interventions, a statistically significant reduction in the biofilm index was found (paired t-test, p=0.049), confirming the improvement in tooth brushing. However, no differences were detected in the tactile or visual self-perception of the presence of biofilm (paired t-test, p=0.700; p=0.461, respectively).

Thus, the improvement in oral hygiene habits, proven by the reduction in the biofilm index of the participants between the interventions, indicated the promising potential of this method of oral health education proposed here, despite the small sample size. Additionally, the children developed a new skill, which involves the tactile perception of biofilm through self-assessment with the tongue, a technique not previously described in the literature.

DISCUSSION

Dental caries is one of the most common chronic diseases in Brazil and worldwide, with a multifactorial etiology, closely linked to sugar consumption, mediated by biofilm, and determined by behavioral, biological, and psychosocial factors. Its incidence is one of the most pressing and relevant issues in public health[17]. Nevertheless, it is a preventable disease, and one of the methods proposed in the literature is the application of effective educational programs and interventions in oral health that can play a crucial role in empowering individuals regarding their oral hygiene[8], individually and collectively.

Among the most widely used methods in oral health education are educational play activities, such as theater, coloring drawings, storytelling, games, and music. Additionally, posters, videos, lectures, and even oral hygiene instruction using macromodels followed by supervised brushing are also utilized. These activities can be adapted to suit the age of the target audience[18].

The application of the method described here, using visual and tactile self-perception, disclosure of dental biofilm, oral hygiene instructions, and supervised brushing in two interventions with an interval of 90 days, showed a significant improvement in the Simplified Oral Hygiene Index (OHI-S) of the participating children, with a reduction in the average from 1.94 in the first intervention to 1.49 in the second intervention. A study carried out in Petrolina, state of Pernambuco, with 144 children aged 6 to 14 years, also using oral hygiene instructions, disclosure of dental biofilm, and supervised brushing showed a reduction in the OHI-S, after 120 days, from 1.94 to 1.11[19]. This reduction may be related to two factors constant in the literature: (1) the increase in the frequency of daily brushing, which in this study can be observed in the results of Step 1, from an average of 1.76 times a day to 2.3 times a day; or (2) improvement in brushing technique since children received complete oral hygiene instructions[4]. The reduction in the amount of dental biofilm is directly linked to the improvement in oral hygiene of these patients, corroborating the prevention of oral diseases, such as cavities[20].

Our findings showed an improvement in knowledge about tooth decay and issues related to oral hygiene and healthy habits among children. After the second intervention, more children knew about tooth decay, its relationship with the consumption of sweets, and what dental floss is, and they also reduced their sugar consumption. A systematic review conducted in 2018 evaluated the effectiveness of educational programs and interventions in oral health and found a positive effect on knowledge, attitude, behavior, and oral health[9]. Moreover, during school age, the age group included in this study, children are curious and eager to apply what they have learned, therefore, it is necessary to provide them with stimuli and information at this age to help develop good oral hygiene habits and enhance their knowledge, also contributing to the prevention of oral diseases[13].

Although there was an improvement in knowledge after the first intervention since an explanation about cavities and oral hygiene was given, there was no difference in the use of dental floss between the two interventions; 92% of the participants did not use dental floss. This high number may be due to the socioeconomic environment in which they live, as dental floss can be expensive[21] and some reported not having any at home. In addition, using dental floss requires manual dexterity and prior instructions, which may lead to a lack of motivation for daily use[22]. Daily use of dental floss is important for removing food residues and bacterial deposits in the interproximal areas, which helps prevent cavities, gingivitis, and bad breath. Therefore, preventive measures should be promoted to teach and encourage the use of dental floss[23].

The results of tactile and visual self-perception did not show statistical differences between the two interventions. However, in the 2nd intervention, results closer to the OHI-S were obtained in both

visual and tactile stimuli. Previous studies on self-perception of oral health have shown positive results, with satisfactory self-perception. These studies were conducted with adults and elderly individuals, supporting this result[24,25]. It is known that while the tactile sense begins to develop during intrauterine life and the visual sense shortly after birth, these senses improve over time with exposure to stimuli. This explains why in 2nd intervention, the self-perception result was closer to the OHI-S result. Additionally, adults and elderly individuals presented better self-perception than children, likely due to previous stimuli[26]. Knowing this, stimuli must be frequent to improve and help them maintain not only oral health but also general health, so that children develop healthier habits, knowledge, and techniques, leading to more autonomy, self-efficacy, and improved quality of life in adulthood.

Given the significant results in the biofilm index over a 90-day period, which had a significant impact on the oral health of participants, the development of healthy and lasting habits is believed to be beneficial for individuals' oral and general health in the long run. The increase in daily brushing frequency proved to be a relevant factor, which may be associated with greater knowledge about oral hygiene, resulting in better quality brushing by participants. This reinforces the importance of actions aimed at health promotion and education.

The present study had some limitations, such as a small sample size, a short follow-up period, and a lack of involvement of family members in the activities. However, it was still possible to identify the results of a promising educational strategy. Therefore, there is a need for new research to address the gaps in the literature. This should include longitudinal studies with larger sample sizes, covering oral health status, self-perception, and oral health education. It is also important to include oral health education programs and actively engage family members.

CONCLUSION

In summary, the stimuli and guidelines proposed by the use of visual and tactile self-perception to identify the presence of dental biofilm as a method of oral health education helped to increase the level of knowledge, improve oral hygiene, and consequently reduce the rate of dental biofilm. This supports the understanding of the importance of good oral hygiene and the development of healthy habits in daily life. These practices help prevent diseases and promote independence in maintaining children’s oral health.

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