

EMOTIONAL RECOGNITION AND RESPONSES OF PRESCHOOL CHILDREN DURING DENTAL TREATMENT

Milena Georgieva, Nadezhda Mitova, Peter Bakardjiev^{ORCID}✉

Received on May 27, 2025

Presented by D. Damianov, Member of BAS, on June 24, 2025

Abstract

Understanding children's emotional responses during dental treatment is essential for improving their experience and the effectiveness of care. The aim of this study is to investigate how preschool-aged children recognize and define their emotions during dental treatment. The study included 150 children aged 4 to 6 years, treated at the Faculty of Dental Medicine in Sofia. Using an adapted version of the Facial Expression Emotional Scale (FEES) and six questions derived from a modified version of the Children Fear Survey Scale – Dental Subscale, the emotional responses of the participants were assessed in relation to common dental procedures. The results showed that non-invasive procedures elicited predominantly positive emotions, such as happiness, while invasive interventions like tooth extractions and dental drilling triggered fear and anger in a significant portion of the children. Anger was the least reported emotion, except in cases involving extractions. Age-based analysis revealed that six-year-olds demonstrated the widest emotional range, while four-year-olds primarily expressed sadness. The study highlights the importance of emotional development during early childhood and the role of dental professionals in recognizing and managing emotions to reduce anxiety and ensure a positive treatment experience. Understanding how children perceive and express emotions through facial cues not only supports their emotional regulation but also improves dentist-patient communication. The collected data offer a useful foundation for future research and may assist clinicians in predicting emotional responses and applying appropriate behavioural strategies to improve outcomes in pediatric dental care.

Key words: preschool children, dental anxiety, emotion recognition, pediatric dentistry, fear management

Introduction. Children's emotions during dental treatment are crucial for establishing the doctor-patient relationship and ensuring the success of the treatment. Children often find it challenging to identify the type of emotions they experience in the dental office. Therefore, various pictorial tests have been developed to help identify emotions through facial expressions.

Children can express their emotions through their facial expressions, their body, their behaviour, and, particularly for younger children, through play. Being curious about these outward signs of emotions can give us clues about how a child is feeling and what they might need. For children, experiencing a range of emotions plays an important part in their development and wellbeing [1]. Children's emotions are unique and complex to interpret, as a single behaviour can often reflect multiple types of emotions simultaneously [2].

Emotional development is a crucial part of human growth that begins at birth and continues into adulthood. From infancy, babies start to express emotions through social smiles and crying, using them as a way to communicate their feelings [3]. As children grow, their emotional range expands, and they develop a greater variety of responses. They display more complex emotions over time such as happiness, anger, sadness, surprise, fear, and guilt [4].

Children start regulating their emotions in a continuous progress that starts at birth with the total dependence on caregivers for emotional management until adulthood when the individuals gain responsibility in emotional management [5]. Between 4 and 6 years old children begin to understand new dimensions in their emotional world: internal experiences like memories, fears and wishes. At these ages, children can establish differences between real emotional experiences like memories and virtual experiences like desires and expectations [6]. This information about their emotions (real or virtual) allows six-year-old children to be fully aware that they can deal with negative emotions like sadness and fear by using certain types of distraction strategies like playing, singing and drawing [7]. They also realize that deregulated expression of emotion like weeping, wailing and shouting will not help them feel better, therefore, they will opt with less frequency for this sort of responses [8]. Toward the end of this developmental period, they begin to comprehend complex dimensions of emotional experiences, such as the possibility of simultaneous emotions [9].

Understanding others' emotions as well as regulating one's own emotions are foundational skills that children acquire and continuously build across development to successfully navigate the social world [9]. Emotions are an important element of nonverbal communication, in particular at an early age before children acquire the vocabulary to express how they themselves feel and to understand

how others feel [8,9].

The aim of this study was to investigate how child patients recognize and define their emotions during dental treatment.

Materials and methods. The study involved 150 preschool-aged children, aged 4–6 years, who underwent dental treatment at the Faculty of Dental Medicine in Sofia. The children were selected through purposive sampling, ensuring they were in good health, had prior dental treatment experience, and no cognitive impairments that could affect emotion recognition. The children are in good health, do not feel pain in the teeth or other body parts, and feel comfortable in the clinic environment. Informed consent was obtained before each interview from the child’s parent/guardian. Only children with prior experience of dental treatment were included. For the purpose of the study, a special statistical form was created, incorporating the “Facial Expression Emotional Scale” (FEES) and six questions regarding the child’s emotions during their visit to the dental office and the procedures related to dental treatment. Given that the instrument is aimed at the target population of preschool children, the basic premise for constructing expressions is clear, simple, and to the point to understand the meaning of the expressions displayed. Data collection was conducted in a quiet, child-friendly room within the clinic, and interviews were carried out by trained professionals experienced in working with young children to ensure comprehension and comfort.

The measuring instrument represents the expression of the seven basic procedures during dental visit. The questions asked to the children included six questions related to dentists and their treatment. These questions were derived from the questions contained in the Children Fear Survey Scale-Dental Subscale questionnaire [10]. The original questionnaire contained 15 questions, but when tested on 30 children for this study, 6 questions turned out to be valid (Cronbach alpha 0.899) with some modification questions, as shown in Table 1. Each question had the same four answer options; happy, sad, angry, and scared, which the child will answer by showing a card containing an emotional expression. Based on FEES, the categories “happy”, “sad”, “scared”, and “angry” were defined (Fig. 1). The results were compared depending on the children’s age and the type of procedures performed. The correct answer is coded 1. The wrong answer or does not know is coded 0.



Fig. 1. Facial Expression Emotional Scale (FEES)

T a b l e 1

Items of questions asked to children

No.	Item
1.	How would you feel if you had to go to the dentist?
2.	How would you feel if the dentist examined your teeth?
3.	How would you feel if the dentist cleans your teeth?
4.	How would you feel if the dentist must get your tooth filled?
5.	How would you feel about having your tooth pulled out/extracted?
6.	How would you feel about having your teeth drilled by the dentist?

Statistical analysis. All responses were digitally recorded and securely stored for subsequent statistical analysis using SPSS v.30.0 statistical software (IBM, Armonk, NY). Descriptive statistics were applied, including frequency distributions for categorical responses.

Results. Participants' responses grouped by age are presented in Fig. 2. The emotion happiness predominates in most scenarios, except for 4-years group. On the other hand, happiness is the main emotion in 6-years group, where 75% of the children show this emotion. The emotion with lower percentage is scared and the lowest shown emotion is angry. The four aged group described only two basic emotions, the fear response appears in five aged group and all basic four emotions are visible in six years group. It can be seen that the "sad" response was given by all age groups, with the highest response in the 4-year age group, where 66.7% participants gave a "sad" response. The "scared" response is the highest percentage 5.3% in the 5-year age group ($\chi^2 = 67.34$, $p < 0.05$).

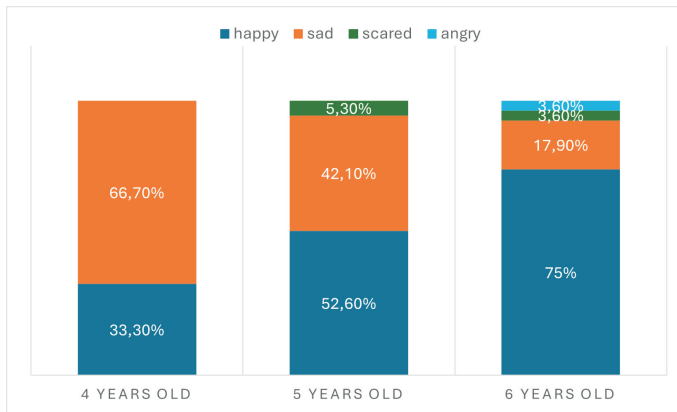


Fig. 2. Distribution of the emotions by age

According to the emotion during procedure the results show that the emotion "happy" predominates in most scenarios, except for procedures involving filling placement, tooth extraction, and the use of dental drills. As expected, when

asked about simply visiting the dentist about 64% of children shared that they feel happy. The least common emotion is “angry”, except in the case of tooth extraction where 38% of patients experience this negative feeling. Fear is experienced during more invasive procedures, such as tooth extraction and the use of dental drills. Children gave more scared answers from the drill 38% in comparison to extraction which is 32%. At the same time, we have angry answer at 32% of children when they hear about extraction ($\chi^2 = 144.29, p < 0.05$).

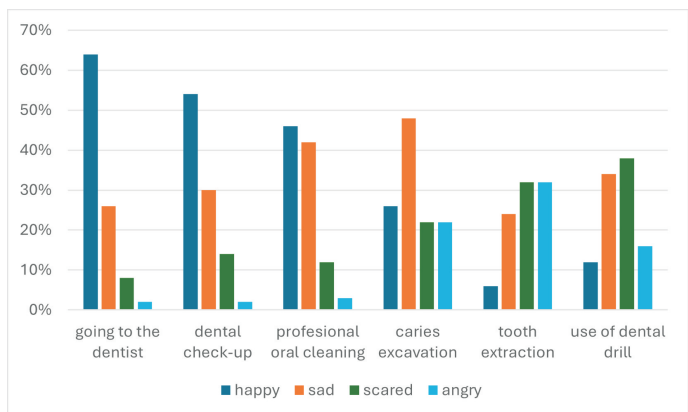


Fig. 3. Distribution of responses according to emotions

Discussion. The findings of this study suggest that most clinic visitors are six years old. The children between the ages of 6 and 8 are commonly associated with dental care due to the eruption of permanent teeth, particularly the first molars.

When analyzing emotional responses by age group, younger participants 4 years age group primarily expressed feelings of either “happiness” or “sadness.” This may be linked to their prior experiences with dentists, as children who are already familiar with dental visits may have more predictable emotional reactions. A child’s behavior during dental treatment is influenced by several factors, including past dental experiences. If a child has previously visited a friendly and welcoming dentist, they are more likely to be cooperative during treatment. A supportive dental environment and a reassuring dentist can significantly reduce fear and anxiety.

Recognizing emotions through facial expressions plays a crucial role in a child’s social development and is an integral part of how they respond to different life situations. A child may experience one emotion internally while expressing a different one at another moment in the same situation. When children struggle to express certain emotions, it can often lead to misunderstandings with those around them. A dentist who can recognize and manage children’s emotions plays a crucial role in minimizing anxiety and ensuring a positive experience.

Dental fear (DF) is a normal emotional reaction to one or more specific threat-

ening stimuli in dental situation while dental anxiety (DA) refers to a state of apprehension that something dreadful is going to happen in relation to dental treatment [11]. Dental anxiety is a multidimensional entity consisting of somatic, cognitive and emotional elements [12].

As expected, in other studies the proportions of children, afraid of invasive procedures, were much higher than those reporting fear of noninvasive items. The most fear-inducing items during dental treatment were drilling and injections as has been reported [13].

It has been shown that fear of various dental procedures decreases with an increasing age [14]. In these reports we found that the number of children reporting fear of non-invasive items was higher among younger children than among older children. According to LEBARON and ZELTZER [15], children may learn to control the way they express their fear as they grow older.

On the other hand, children who are less impulsive and have a more fearful temperament are more likely to experience emotional difficulties [16]. Individuals with a fearful temperament, particularly those who fear losing control, tend to have higher levels of dental fear. Similarly, research has explored a genetic link to this issue. Children with social-emotional behavior issues are more likely to exhibit uncooperative behaviour during dental treatment [17].

The key findings indicated that the three-year-olds took much longer to respond and made considerably more recognition errors compared to the six- and nine-year-olds. This suggests that the three-year-olds had more difficulty recognizing and responding to facial expressions of emotions than the older children [18]. Understanding emotions requires processing various layers of language, perception, and concepts. Before children fully grasp the complexity of emotions, the words they learn can shape their understanding. In other words, children may become familiar with emotional words before they completely comprehend their deeper meanings. For instance, a child might learn the word “anger” early on, but it takes more time for them to develop an adult-like understanding – such as distinguishing between “anger” and “disgust” in images or recognizing the different situations that correspond to each emotion [19].

Based on a review of the relevant studies’ results, GAGNON et al. [19] reported that children in preschool age recognized well happiness and sadness, but much harder identified other emotions, particularly fear and disgust, suggesting their much slower developmental pattern of recognition. The authors concluded that happy, sad and angry faces are identified at an earlier age than those expressing fear, disgust, and surprise [20]. Results of previous research suggest that facial emotion recognition skills develop during preschool age period, but findings were inconsistent in terms of the development of recognition accuracy of each basic emotion, except for happiness which are the same results as in our research.

The findings of this study can provide a useful foundation for future research on children’s emotional responses to dental care. Furthermore, the collected data

may assist clinicians in predicting children's emotions during treatment and applying appropriate strategies to manage them, resulting in improved experiences and outcomes.

Conclusion. Non-invasive procedures are associated with positive emotions, unlike invasive dental treatments, which evoke feelings of fear and anger in a significant portion of children aged 4–6 years. The ability to recognize emotions through facial expressions is a skill that children need to develop. This ability will help them express and manage their own emotions effectively.

REFERENCES

- [1] WADJI D. R. N., R. DESPRILIANI, A. S. SETIAWAN (2023) Exploring preschoolers' emotions in pediatric dentistry, *Eur. J. Dent.*, **17**(4), 1294–1299.
- [2] CHEN I.-J. (2012) Children's emotions and behavior in painting activities, *J. Coll. Teach. Learn.*, **10**(1), 89–100.
- [3] SETIAWAN A. S., R. DESPRILIANI, Y. HERDIYATI (2021) Recognition of emotions through cartoon facial expressions in preschoolers, *J. Pediatr. Dent.*, **7**(3), 121–127.
- [4] NEGRÃO J. G., A. A. C. OSORIO, R. F. SICILIANO et al. (2021) The child emotion facial expression set: a database for emotion recognition in children, *Front. Psychol.*, **12**, 666245.
- [5] DENNIS T. A., D. A. KELEMEN (2009) Preschool children's views on emotion regulation: Functional associations and implications for social emotional adjustment, *Int. J. Behav. Dev.*, **33**(3), 243–252.
- [6] THOMPSON R. A., E. A. VIRMANI, S. F. WATERS (2013) The development of emotion self-regulation: The whole and the sum of the parts. In: *Handbook of Self-regulatory Processes in Development*, 5–26.
- [7] BENDER P. K., M. L. REINHOLDT-DUNNE, B. ESBJØRN, F. PONS (2012) Emotion dysregulation and anxiety in children and adolescents: Gender differences, *Pers. Individ. Dif.*, **53**(3), 284–288.
- [8] GUARNERA M., Z. HICHY, M. I. CASCIO, S. CARRUBBA (2015) Facial expressions and ability to recognize emotions from eyes or mouth in children, *Eur. J. Psychol.*, **11**(2), 183–196.
- [9] AKTAR E., C. A. NIMPHY, B. VAN BOCKSTAELE et al. (2022) The social learning of threat and safety in the family: Parent-to-child transmission of social fears via verbal information, *Dev. Psychobiol.*, **64**(3), 1–20.
- [10] SUZY A., J. AMRIWIJAYA, E. FITRIANA (2015) Trans-adapted, reliability, and validity of children fear survey schedule-dental subscale in Bahasa Indonesia, *Dent. J.*, **48**(1), 1–6.
- [11] KLINGBERG G., A. G. BROBERG (2007) Dental fear/anxiety and dental behaviour management problems in children and adolescents: A review of prevalence and concomitant psychological factors, *Int. J. Paediatr. Dent.*, **17**(6), 391–406.
- [12] AGARWALLA S., B. CHANDRA, G. K. KUNDU (2024) Influence of age and gender on emotional intelligence, intelligence quotient, anxiety, and behavior of children in a dental setup, *Int. J. Clin. Pediatr. Dent.*, **17**(5), 518–523.

- [13] NAKAI Y., T. HIRAKAWA, P. MILGROM et al. (2005) The children's fear survey schedule-dental subscale in Japan, *Community Dent. Oral Epidemiol.*, **33**(3), 196–204.
- [14] VIINIKANGAS A., S. LAHTI, S. YUAN et al. (2007) Evaluating a single dental anxiety question in Finnish adults, *Acta Odontol. Scand.*, **65**(4), 236–240.
- [15] LEBARON S., L. ZELTZER (1984) Assessment of acute pain and anxiety in children and adolescents by self-reports, observer reports and a behavior checklist, *J. Consult. Clin. Psychol.*, **52**(5), 729–738.
- [16] AUNOLA K., J.-E. NURMI (2005) The role of parenting styles in children's problem behavior, *Child Dev.*, **76**(6), 1144–1159.
- [17] CADEMARTORI M. G., M. B. CORRÊA, R. A. SILVA, M. L. GOETTEMES (2019) Childhood social, emotional, and behavioural problems and their association with behaviour in the dental setting, *Int. J. Paediatr. Dent.*, **29**(1), 43–49.
- [18] PRICE G. F., M. OGREN, C. M. SANDHOFER (2022) Sorting out emotions: How labels influence emotion categorization, *Dev. Psychol.*, **58**(9), 1665–1675.
- [19] GAGNON M., P. GOSSELIN, R. MAASSARANI (2014) Children's ability to recognize emotions from partial and complete facial expressions, *J. Genet. Psychol.*, **175**(5–6), 416–430.
- [20] ASENOVA I., M. KOURTI (2021) Trajectory of early development of facial emotion recognition in typically developing children, *Psychol. Res.*, **24**(2), 160–167.

*Department of Pediatric Dentistry, Faculty of Dental Medicine,
 Medical University – Sofia, 1 St. Georgi Sofijski Blvd, 1431 Sofia, Bulgaria
 e-mails: milena.georgieva@fdm.mu-sofia.bg, n.mitova@fdm.mu-sofia.bg
 bakardjiev@fdm.mu-sofia.bg/bucki_tuz@yahoo.com,
<https://orcid.org/0009-0008-1149-2211>*