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# CORRELATION BETWEEN SELF REPORT SCALE AND PHYSIOLOGICAL MEASURES OF DENTAL ANESTHESIA ANXIETY IN CHILDREN WHILE LISTENING TO MUSIC

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## *ABSTRACT*

***Background**: Dental anxiety of local anesthesia and extraction was the main reason for children to avoid dental treatment. Music therapy is an alternative approach in reducing the physical and psychological stress of children during visits to the dentist. **Objective**: To determine and correlate the level of dental anxiety on dental anesthesia procedure in children while listening to music, using psychometric and physiological measures. **Methods**: A total of 32 children aged 7-10 years were recruited from patients presenting to Dental Hospital. Subjects divided randomly into two groups. The first group had dental procedure with music and the other group without music. Both were asked to choose FIS (Face Image Scale) and had pulse oximetry examination to measure the level of anxiety before and during treatment. **Results**: Coefficient correlation (0.136) was found between FIS and pulse oximetry, indicated that the correlation between two instruments on children's anxiety levels was positive although not statistically different. **Conclusion**: Dental anesthesia anxiety while listening to music was reduced significantly different in both psychometric and physiological measures.*

***Keywords:** Dental anxiety, distraction, music*

## ABSTRAK

**Latar belakang:** Kecemasan terhadap tindakan anestesi lokal dan pencabutan gigi sering kali menjadi penyebab anak menghindari perawatan gigi. Terapi musik adalah pendekatan alternatif untuk mengurangi tekanan fisik dan psikologis anak saat berkunjung ke dokter gigi. **Tujuan**: Menjelaskan korelasi tingkat kecemasan dental pada tindakan anestesi dengan mendengarkan musik menggunakan alat ukur psikologis dan fisiologis. **Metode**: Tiga puluh dua anak usia 7 - 10 tahun yang akan mendapatkan tindakan anestesi dan pencabutan direkrut dari pasien yang datang ke Rumah Sakit Gigi dan Mulut. Subjek dibagi secara acak ke dalam dua grup, yaitu kelompok perlakuan yang mendapatkan prosedur dental dan musik serta kelompok kontrol yang mendapatkan prosedur dental tanpa musik Dua alat ukur FIS (*Face Image Scale*) sdan *pulse oximetry* digunakan untuk mengukur tingkat kecemasan sebelum dan saat dilakukan tindakan. **Hasil**: Koefisien korelasi sebesar 0.136 didapatkan antara FIS dan pulse oximetry, menunjukkan adanya korelasi positif pada kedua instrument meskipun tidak berbeda bermakna secara statistik. **Kesimpulan**: Kecemasan dental pada tindakan anestesi dengan mendengarkan musik dapat mengurangi kecemasan yang bermakna secara statistik pada pengukuran psikologis dan fisiologis

**Kata Kunci:** Ansietas dental, distraksi, musik

## INTRODUCTION

Anxiety is a basic emotional state that present in humans and can be defined by affective (basic emotional feelings), perspective (realization of bodily or psychomotor sensations) and cognitive. In addition to these subjective components, behavioral and physiological characteristics can be used to define anxiety.[1] According to Taylor, anxiety is a subjective experience of restless mental tension as a general reaction and the inability to face problems or a sense of security.[2] This unpleasant feeling generally causes physiological symptoms (shaking, sweating, increased heart rate) and psychological symptoms (panic, tension, confusion, difficulty concentrating). The intensity of anxiety differs depending on the seriousness of the threat and the effectiveness of one's sense of security. Feelings of pressure and helplessness will arise if a person is not ready to face threats.[2]

Dental anxiety denotes a condition of abnormal fear in relation to dental care and a major problem that develops mostly childhood and adolescence. The origin of a child's dental anxiety can vary significantly. Some children showed dental anxiety in relation to specific dental stimuli, for some instances needles or burs. While other children have more general anxiety.[3,4,5]

Anxiety in local anesthesia and dental extraction is the main reason for children to avoid

dental treatment. Local anesthetics solution to control pain during dental procedures produces pain and discomfort feeling, therefore anxiety that can lead to unfavorable behavior afterward. The penetration of the anesthetic needle sometimes made perception of pai.[6,7]

Various methods for reducing patient dental anxiety was develop as non pharmacology approach like distraction. Distraction is a technique to divert the patient attention from an unpleasant procedure.[8] McCaul and Mallot developed the distraction theory by emphasizing the fact that humans have a limited capacity for attention.[9] They showed that "an individual must concentrate on a painful stimulus to feel pain, therefore the perception of pain decreases when a person's attention is distracted away from the stimulus".[10,11,12]

Based on research conducted by Moola, music is an alternative choice that has been used in many medical fields to conform the physiological, psychological and spiritual needs of patients. Research on the effects of music therapy for medical patients has increased over the past 20 years and showed various results in various medical fields.[13] The anxiolytic effects of music have been studied in various medical patients. In dentistry, music is an approach to dental anxiety problems that has the ability to reduce anxiety, pain, facilitate relaxation, improve the dentist-patient relationship and be useful in recovery time after treatment (shorter time, less disruption and lower cost). Music therapy is a useful alternative in reducing the physical and psychological stress of a child during a visit to the dentist.[14]

Anxiety causes physiological and psychological symptoms that can be measured using facial image scale (FIS) and pulse oximetry. FIS is a tool to measure dental anxiety in children containing a row of 5 facial images from very happy to very dissatisfied with a score range from 1 to 5. Pulse oximetry measures oxygen delivery to tissues. Pulse oximetry measurement results can increase due to obstruction of the tube or airway, inadequate ventilation, circulation and so on.[15,16]

## METHOD

Approval from The Research Ethics Committee Faculty of Dentistry Moestopo University was obtained prior to the study (Approval No. 2018/ 148). The research was pre-test and post-test design that was carried out in the Pediatric Dentistry department of the RSGM Prof. University. Dr. Moestopo (Beragama). Purposive sampling of children aged 7-10 years were recruited from pediatric patients attending to Dental Hospital. Informed oral and written consent was obtained from parents or family joining the children to hospital. Sample size was determined by Federer's formula and obtained the number of 32 children. Subject selection based on inclusion and exclusion criteria. with no distinction between boys and girls. Inclusion criteria included patients came for extraction anterior tooth treatment. Inclusion for also the first timer for dental extraction and never received infiltration anesthesia yet. Subjects randomly divided into two groups with 16 children in each group. The first group had dental anesthesia with music and the other group without music. The instruments used in this study were FIS (Facial Image Scale) and pulse oximetry. The FIS examination and pulse oximetry were carried out twice, before anesthesia and when music distraction was given at the same time as anesthesia. Giving music as a distraction is done using a mobile phone that is connected via a headset. Subjects were asked to choose 1 of 3 choices of songs from the current era: Let it go (Frozen soundtrack); How far i'll go (Moana soundtrack) and *Meraih Bintang* (Asian Games 2018 soundtrack) so that children feel calmer with a choice of songs that they were familiar and liked. The child will be given an FIS image and asked to choose an image that reflects the child's feeling at that time and a pulse oximetry is placed on the left thumb and a button is pressed to calculate the child's pulse rate and oxygen saturation level before the action and when given musical distraction along with anesthetic action. Data analysis were descriptive statistics, Mann-Whitney test, and Spearman rank test.

## RESULT

FIS and pulse oximetry measurements of dental anxiety on dental anesthesia procedure with and without music presented in table 1 and 2. It showed that there was significant difference between group with and without music distraction using Mann Whitney test ($p < 0.001$).

Spearman Rank correlation was used to determine whether there is a relationship between changes in dental anxiety with FIS and pulse oximetry before and during dental anesthesia procedure with and without music. From the data of statistical below, it can be concluded that there is a positive correlation between FIS and pulse oximetry on the assessment of dental anxiety with $r = 0.14$ or 1.85% which is not statistically significant different.

**Table 1.** Comparation of dental anxiety between dental procedure with and without music as measured by Facial Image Scale

| | n | Mean difference | *p* |
|---|---|---|---|
| Dental anesthesia procedure with music | 16 | -2,44 | <0,001 |
| Dental anesthesia procedure without music | 16 | | |

**Table 2.** Comparation of dental anxiety between dental procedure with and without music as measured by Pulse Oximetry

| | n | Mean difference | *p* |
|---|---|---|---|
| Dental anesthesia procedure with music | 16 | -17,19 | <0,001 |
| Dental anesthesia procedure without music | 16 | | |

**Table 3.** Correlation of FIS and pulse oximetry on dental anxiety using Spearman Rank Test

| | | Pulse Oximetry |
|---|---|---|
| Facial Image Scale | *r* | 0.14* |
| | *p* | 0,308 |
| | *n* | 32 |

**DISCUSSION**

Anxiety is a problem that causes children to often refuse and be uncooperative towards dental and oral care procedures. Physiological signs of anxiety include shortness of breath, increased pulse and blood pressure, and dry mouth, diarrhea, constipation, restlessness, sweating, tremors, headaches and sleep disturbances.[6] Some of the signs of physiological anxiety can be seen in pediatric patients during dental procedures. It is very important for the dentist to understand the child's behavior and take a psychological approach. Good preparation of pediatric and parental patients at the first visit for dental and oral care will result in better patient behavior.[17]

Anxiety in parents has a major influence on a child's behavior, especially if the child has had previous negative experiences. Attitudes of parents shape children's behavior directly in the early period of development. Things that can be done to reduce anxiety in parents are educating parents before their child comes to the dentist for the first time, getting an explanation of the procedure over the phone before coming to the dentist, looking for information by looking at the dental website and conducting a pre-visit before bringing their child to the dentist.[18]

In general, parents' expectations of their child's behavior (no crying, no fuss) were not fulfilled. Parents' expectations of dentists in "driving" their children are also very high. Some parents often dictate care even though their knowledge of treatment procedures is very lacking.[19] Effective communication where parents actually represent dentists to be able to overcome children's behavior problems and together find out what the children's likes and interests are so that they can build a sense of trust and a sense of security for children and cause positive reactions from children during dental and oral care.[20]

When the body receives stress from the environment such as danger or threat, nerve and endocrine cells work together to prepare the body for action. Stres response divide into short term and prolonged stres that manage by two different pathway, known as neural pathway and hormonal pathway. Both had direct connection with hypothalamus. A reaction initiated in the amygdala triggers a neural response in the hypothalamus followed by activation of the pituitary gland and secretion of adrenocorticotropic hormone (ACTH). The release of chemical signals results in the production of the steroid hormones.[21]

The neural pathway caused hypothalamus send nerve impulse to sympathetic nervous. This impulse generated sympathetic nervous system mostly start from spinal cord that activates numerous complex pathways to enable an adequate response to a threat or trauma. These functions activate physiological changes that occur during the fight or flight response, as an active protective response when the body reacts to a danger, stressful, anxious, afraid or even happy situation. Some of these physical effects include faster breathing, increased heart rate and blood pressure, dilation of pupils, redirection of blood flow to important organs (e.g. brain and muscles), and increased sweating by releasing norepinephrine during reaction. For the balancing the parasympathetic nervous system located in the spinal cord and medulla activate the rest and digest or relaxation response that return the body to homeostasis after the fight or flight response.[22,23]

Behavioral management in pediatric patients is very important in the practice of pediatric dentistry and pays great attention to communication and education factors. The pediatric dental triangle is a dynamic process between children, parents and the dental team. This can be started before the patient undergoes curative action where information is obtained about pediatric patients and the exchange of ideas, voice intonation, body movements, facial expressions and touch.[17]

The development and variety of views on dental care is very important for dentists to have a broad view of behavior management techniques and communication techniques to meet the needs of each child.[17,20]

A child's ability to face dental procedures depends on his developmental phase. Children's attitudes can be divided into cooperative, cooperative and uncooperative potential. Uncooperative children usually occur in children who are still too young and in patients with disabilities and special needs. Many factors influence a child's dental treatment, such as the growth and development of the child. Child development includes physical, intellectual and emotional aspects of growth. These aspects show constant changes in size and magnitude. At the intellectual age of 3 years, there are developments that indicate a readiness to receive dental treatment. Children with normal physical appearance but exhibit behavioral or sociological problems, may be termed

as "unmanageable" patient with little realization that they may interpret some form of brain damage.[24]

Music is able to reduce psychosomatic symptoms such as anxiety by influencing physiological and psychological processes that can make patients experience a safe and pleasant state. Music can increase endorphins which can affect mood which can reduce patient anxiety and cause feelings of calm, relaxation and can reduce pain. Music is a non-invasive technique that can calm patients and distract them from the thoughts of being treated in dentistry and the sounds of drilling produced during the treatment.[25]

Patients listening to music before treatment will show a decrease in nervousness. Several studies on how to determine music for relaxation in children were carried out by allowing patients to enjoy music of their own choosing.[26] This is able to reduce physiological parameters because some entertaining music in today's era has significantly increased the patient's relaxation. The physiological effects of calming music can relieve a child's discomfort, lower cortisol levels and release endorphins which have calming, analgesic and euphoric properties.[27]

Spearman correlation test is a non-parametric statistical test aimed at knowing the correlation between two or more ordinal-scale variables with abnormal distribution of data.[28] Based on the results of the study, the correlation coefficient was 0.14 which indicated that the level of strength of correlation between the FIS and pulse oximetry on the child's dental anxiety was positive but not statistically different. This indicates the relationship between the two variables is unidirectional so it can be concluded that musical distraction affects changes in anxiety in children aged 7-10 years as measured by changes in FIS and pulse oximetry in children before and during infiltration anesthesia.

The practice of pediatric dentistry cannot be separated from the anxiety experienced by pediatric patients that often associated with pain during dental and oral care procedures. This behavior can manifest in various patterns, such as increasing in FIS and pulse oximetry levels. Therefore, it is very important for dentists to understand children's behavior and to approach psychological interventions such as providing musical distractions to reduce anxiety in children.
Limitation of this study was lesser sample size and short time of clinical study. Further needs additional research with a larger group and use other measurement media such as blood pressure, electrodermal activity, FLACC (Face, Legs, Activity, Cry and Consobility) scores and salivary alpha amylase which can also be used as biomarkers for measuring anxiety in children.

## CONCLUSION

Musical distractions whose songs are known and liked by children can reduce children's anxiety when infiltration anesthesia is carried out and indirectly increase children's cooperation during dental procedures. FIS and pulse oximetry had positive correlation but not statistically significant in reducing dental anxiety by the use of music during dental anesthesia procedure.

## CONFLICT OF INTEREST

There are no conflicts of interest.

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