International Journal of Chemical and Biochemical Sciences
(ISSN 2226-9614)

Journal Home page: www.iscientific.org/Journal.html

Evaluating the Effect of Voice Control as a Distraction Strategy in Children with Dental Anxiety During Treatment

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Abstract

To evaluate the effect of voice control on the dental chair side behavior of children with dental anxiety during dental treatment and its influence on the operator stress and the duration of the appointment. This Randomized Case Controlled Trial included 48 children with dental anxiety requiring dental treatment. The study group was treated after distributing their favorite story book series and the control group was treated with conventional behavior management strategies. The children's behavior was evaluated using FLACC-Scale and Frankl behavior rating scale. The operator stress was evaluated using FIS scale and the duration of appointment was recorded. In the study group 14 children 64% of children refused to undergo the dental treatment. The FLACC Score was 7 in the study group and 4.5 in the control group. The range is (2.5-8.5) The difference between both the groups during the overall treatment was significant (p=0.015-Mann Whitney U Test) and significantly more children showed a negative behavior P=0.001; Chi-square test). Distraction using story books is not useful in managing the dental chair side behavior of children with dental anxiety.

Keywords: Dental anxiety, distraction, behavior, management, strategies

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1. Introduction

Anxiety is a typical emotion that is essential to our existence and daily activities. It aids with our ability to stay out of potentially hazardous circumstances and helps us get ready for difficulties. [1] One definition of anxiety states that it is a transient emotional state of the human body typified by heightened autonomic nervous system activity and subjective feelings of tension. This type of emotional reaction is often portrayed as a defense mechanism because it is externalized in the face of an immediate threat of danger (either objective or subjective), leading to physiological reactions indicative of alertness (headache, muscle tension, feelings of suffocation, tachycardia, sweating, and dizziness). Diarrhea, incessant activity, nervous tics, excessive perspiration, and/or behavioral inhibition are some potential symptoms. everyday traumatic life situations, like dental appointments [2,3]. Excessive anxiety might cause a Pediatric child to be reluctant during dental treatment, making it challenging or impossible to complete. The most prevalent issue encountered by Pediatric dentists is the lack of collaboration brought on by severe anxiety. Additionally, it should be highlighted that patients with significant levels of anxiety during dental surgery may require longer treatments and will pay more money. Additionally, dental anxiety is thought to be the most accurate predictor of a child's behavior throughout treatment. Additionally, sensory, cognitive, and emotional components all have a role in how dental pain is experienced. Several researchers have discovered a direct link between a child's perception of pain and dental anxiety [4-8].

In patients who put off getting dental care due to worry, a vicious cycle develops in which putting off dental care causes dental degeneration and patient feelings of inadequacy and shame. The individual's dental health will suffer as a result of this social conflict, along with aesthetic and functional unhappiness, dictating their lifestyle and jeopardizing their biopsychosocial well-being. Any negative remarks should be avoided when the child is present because the theory that dental fear is acquired is supported by one's own negative experiences, unfavorable judgements, and opinions expressed towards the figure of the dentist in the family and/or immediate environment [9-11].

Children require special training, as well as the practitioner's skill, the working systems, age-appropriate protocols, a pleasant atmosphere in the dental office, appointment scheduling (ideally in the morning and without keeping the kids waiting), or the presence or absence of parents in the dental office. The child's personality and characteristics, the family's influence the child's prior negative experiences or those of those in the patient's environment (parents, siblings, or friends) the frequency and number of dental visits, the child's cognitive and emotional development, and predisposition to treatment are additional variables that are beyond the dentist's control [12,13].

To lessen excessive anxiety, a variety of methods have been proposed. These methods include (a) communication techniques such as tell-show-do, direct observation, ask-tell-ask, voice control, non-verbal communication, positive reinforcement, and distraction; (b) other fundamental methods like parental presence or absence, memory restructuring, and nitrous oxide inhalation; and (c) more sophisticated methods such as protective stabilization, sedation, and general anesthesia. Reduced fear and a positive dental experience for the child improve treatment compliance, lower the risk of occurrence of caries, and foster trust between the patient and the dentist [14]. In response to an unpleasant experience, behavior can be changed in a variety of ways. With the use of distraction during dental treatment, virtual reality (VR) has recently been introduced in the dental sector as a therapy that may lessen dental pain and anxiety. A well-known strategy is distraction, which focuses attention away from the painful sensation. One of the earliest studies endorsing this idea was the "gate control" theory, which Melzack et al. published in 1965. The study describes a "gate" in the medullary dorsal horn that allows painful sensations to pass through and is influenced by A-beta fiber activation [15]. These fibers, which are thick and myelinated, block A-delta and C fiber conduction and transmission (closing the gate), allowing the painful stimuli to open the gate. This idea has been used in previously published publications to decrease the transduction of nociceptive stimuli during dental treatment utilizing a VR headset. Hypnosis, music, audio-visual media, and virtual reality are currently the most widely utilized distraction techniques. Almost all these methods rely on distraction, relaxation, mimicry, and systematic desensitization [16]. By restricting the input of stimuli from the real environment and enhancing the input from the virtual environment, these VR technologies increase presence in the virtual environment while diminishing presence in the real world through perceptual mechanisms. The most widely used components are virtual reality goggles and integrated auditory helmets; with them, the subject's visual and auditory fields are practically covered by the virtual information, preventing sensory input from the real dental world, in which the patient is truly immersed (sound of turbines, sight of instruments, needles, injections, etc.). The goal is to immerse the patient in and transport them to "a parallel reality" that is more pleasurable and incapable of making them aware of anything unpleasant [17]. The idea is to move the patient to "a parallel reality" that is more pleasant for them and in which they are unable to see unpleasant dental aspects. A more potent distraction can result from the simultaneous stimulation of sight and hearing or sight, hearing, and touch. The cost of VR headsets is currently lower than that of traditional audio-visual media, and they can achieve a greater level of immersion in a specific scenario. They establish a sensory protective barrier while allowing the user to engage with stimuli and escape from the outside world [18]. Despite the abundance of studies on the topic, there is still no strategy that is universally approved for regulating the behavior of Pediatric patients and controlling anxiety, particularly when treating uncooperative patients who ignore their dental health care. Even though the results suggest that this strategy considerably reduces the symptoms of dental anxiety and misbehavior, there have been several studies on the use of a VR headset to divert children during dental treatment, with the exception of the study by Sullivan et al. Furthermore, no research has been done up to now on how this procedure affects variables related to oral health, like how frequently people clean their teeth or how their dental health is reflected. Dental anxiety is a world - wide phenomenon affecting children globally by a percentage of 6-15%. The use of story books as a distraction strategy showed little help to the operator to reduce stress but did not show much improvement on pain related behavior and mean duration of appointments [19].The aim of the study was to evaluate the effect of voice control distraction strategy in children with dental anxiety during dental treatment.

2. Methodology

A Randomized Case Controlled Trial was conducted on out-patients attending the OPD. Informed consent and assent were obtained from children and parents in accordance with ethical principles of Helsinki Declaration. The investigation was to test the applicability of voice control distraction strategy in children.

2.1. Inclusion criteria

Children within the Pediatric age group with documented evidence of dental anxiety.
Those children who required dental treatment

2.2. Exclusion criteria

Children who were not willing to participate.

2.3. Primary Outcome

Child pain related behavior was assessed using FLACC Scale. During data collection period dental treatment was performed by the same dentist.

2.4. Randomization

The participants were divided into two groups using fishbowl method-24 in study group and 24 in control group. Allocation sequence was generated using SNOSE method, thereby it was concealed to the dentist. Study group received their favorite story book and the control group received voice control.

2.5. Dental procedure

Parents were present in the operatory. A library was displayed to the children, and they were allowed to choose their favorite story books before the dental treatment. Dental treatment was done in four steps for restoration namely local anesthesia administration, rubber dam application, caries excavation and restoration.

2.5.1. Outcome

Child pain related behavior. Assessment was rated using **FLACC Scale and Frankl's scale** as they are recommended measurement tools. **Duration of appointment** was recorded from start to end of the procedure. **Operator stress** was recorded using Facial Image Scale.

2.6. Training and calibration

Cohen's Kappa Statistics was used for inter-examiner reliability and for the total (k=0.85) which was excellent. **Descriptive statistical analysis** was performed. Continuous variables were tested for distribution using

Kolomogrov- Smirnov test. Between group comparison was performed with 2 sample T-test (normal distributed data).

Mann Whitney – (Non-Normal data distribution)

For statistical purposes the behavior of each child was dichotomized as +, definitely + and – and definitely negative. **Chi square** was used for categorical variables.

3. Results and Discussion

Fifty-four samples were recruited, 6 were excluded. Table 1 In our study illustrated that the study group consisted of 22 patients with a mean age range of 8.0 +/- 1.8 years, 12 males-55 % and 10 females-45%. The control group consisted of 23 patients with a mean age of 7.9 +/- 1.8 years. There were 15 males-65% and 8 females (35%). No significant differences were found according to age or gender p= 0.435; t-test, p=0.465; Chi square test respectively. Table 2 in our study illustrated that 28 restorations were performed in the study group and 31 in the control group. No significant difference was found between the groups (0.298; t-test). Table 3- In the study group 14 children 64% of children refused to undergo the dental treatment. The FLACC Score was 7 in the study group and 4.5 in the control group. The range is (2.5-8.5) The difference between both the groups during the overall treatment was significant (p=0.015-Mann Whitney U Test) and significantly more children showed a negative behavior P=0.001, Chi-square test). During anesthesia(p=0.075) and rubber dam application (p=o.303) there were no significant differences among the groups.

3.1. Frankl Scale

In the study group 68% showed negative behavior and 30% in the control group. Difference between groups was statistically significant (p=0.011, Chi square test).

3.2. Time of Appointment

Mean duration was 33.4+/ - 4.7 minutes in study group and 32.3 +/- 4.0 minutes in control group, with no significant difference between the groups (p=0.221; t-test).

3.3. Operator stress

The mean stress FiS Score was 46.8+/-15.5 in the study group and 41.3 +/- 13.2 in the control group with no significant differences between the groups (p=0.103, t-test).

Outcome: Child pain related behavior.

Assessment was rated using FLACC Scale and Frankl's scale as they are recommended measurement tools. This is in accordance with previous studies done by Bagattoni ,2020. Study group consisted of 22 patients with a mean age range of 8.0 +/- 1.8 years, 12 males-55 % and 10 females-45%. The control group consisted of 23 patients with a mean age of 7.9 +/- 1.8 years. There were 15 males-65% and 8 females (35%). No significant differences were found according to age or gender p= 0.435; t-test, p=0.465; Chi square test respectively. 28 restorations were performed in the study group and 31 in the control group. No significant difference was found between the groups (0.298; t-test). In the study group 14 children, 64% of children refused to undergo the dental treatment. The FLACC Score was 7 in the study group and 4.5 in the control group. The range is (2.5-8.5) The difference between both the groups during the overall treatment was significant (p=0.015-Mann Whitney U Test) and significantly more children showed a negative behavior P=0.001, Chi-square test). During anesthesia (p=0.075) and rubber dam application (p=o.303) there were no significant differences among the groups (Table 2).

3.4. Frankl Scale

In the study group 68% showed negative behavior and 30% in the control group. Difference between groups was statistically significant (p=0.011, Chi square test).

3.5. Time of appointment

Mean duration was 33.4+/ - 4.7 minutes in study group and 32.3 +/- 4.0 minutes in control group, with no significant difference between the groups (p=0.221; t-test).

3.6. Operator stress

The mean stress FIS Score was 46.8+/-15.5 in the study group and 41.3 +/- 13.2 in the control group with no significant differences between the groups (p=0.103; t-test). Avoiding unpleasant and ineffective actions, providing a pleasant and trusting environment that can aid the performance of treatment, and cultivating good attitudes towards future dental care are the main goals of strategies to reduce anxiety and better control conduct within the dental office. The participants' oral hygiene was generally of a moderately acceptable standard, with 86.3% of them brushing their teeth once or twice daily. It was discovered that children who brushed their teeth less frequently also experienced higher levels of anxiety and misbehaved more frequently in both the VR group and the control groups [20-22]. The "tell-show-do" method, in the literature, is the method most frequently used in studies to elicit the cooperation of children. This is followed by the positive reinforcement method, which was also used by the trained professional who looked after the children. Distraction strategies are the second most popular strategy, according to other authors. It is not necessary to have any special equipment in order to employ the "tell-show-do" and positive reinforcement techniques, in contrast to strategies based on distraction with Virtual Reality. This study examined the primary modulating elements and the potential effects of using a VR headset to alter children's fear and behavior. Physiological factors are considered in certain research using VR systems in dentistry, whereas others merely include age and sex [23-25]. The impression of discomfort or physiological changes were not considered in this investigation. Furthermore, given that the patients were young children, questions or comments about pain were purposefully avoided because they could trigger disruptive conduct. An earlier pilot study had employed a pulse oximeter to track variations in heart rate and oxygen saturation, but due to the kids' young age, the use of the device seemed to scare them. To avoid training the patients, physiological changes were not tracked during the trial [20]. Dental anxiety is more common in females than in boys, and it becomes less common as children get older. Age and gender, on the other hand, were not found to be independent predictors of dental anxiety or behavior in the current investigation. According to what Jeddy et al. have written, an increase in dental visits does appear to have a negative impact on the child's behavior. As they are developing acceptance mechanisms and learning to differentiate between procedures that cause tension and those that do not, the authors of the method described how there is greater anxiety and terror during the initial sessions than during the last ones

[21]. Themmessl-Huber et al.'s meta-analysis investigated the association between parents and older (8–10-year-old) and younger (0–8-year-old) children's dental phobia.

Table 1(a). Distribution Pattern in Study Group

Participants N=22	Percentage	Mean age range	P value- T- Test
Males=12 Females=10	55% 45%	8.0 +/- 1.8 years	0.435

Table 1(b). Distribution Pattern in Control Group

Participants N=23	Percentage	Mean age range	P value-Chi square test
Males=15 Females=8	65% 35%	7.9. +/- 1.8 years	0.465

Table 2: Treatment Distribution Pattern

Study group	Control group	Association
28	31	NS-0.298-T-Test

Table 3(a). Treatment Refusal Pattern

Study Group	N=14	% N=64	FLACC Score=7	FLACC Score Range=2.5-8.5
Control Group			FLACC Score=4.5	

Table 3(b). Distribution Pattern of Association

Mann Whitney U Test	P value=0.015= Significant
Chi square Test	P Value=0.001

Table 4. Treatment Acceptance Pattern

During anesthesia	P value=0.075
During rubber dam application	P value=0.303

Table 5. Negative Behavior Pattern

Study Group	N=68 %	Chi square test
Control Group	N= 30%	P = 0.011

The visual Facial Image Scale test, the DAS questionnaire, and the Frankl Behavior Assessment Rating Scale [32] were used in the current investigation to assess anxiety. We discovered that when using these specific assessment methods, as opposed to those acquired in other studies employing unspecified methodologies, the results were different for the older group of kids (8 to 10-year-olds). The VR Zeiss Cinemizer OLED system is readily accessible and readily available on the market. Additionally, the patients in this study underwent dental procedures that are frequently done in pediatric dentistry [22]. A recently released meta-analysis demonstrates that VR considerably decreased dental anxiety in kids because it was a useful diversionary technique appropriate for a variety of dental procedures. Direct comparisons were also challenging due to the research design's variability, as there were significant disparities in the age groups analyzed, the questionnaires employed, and the sort of treatment administered. FIS, a very user-friendly visual exam that was chosen to measure children's dental anxiety, prevented direct comparison of results with non-visual measures like MDAS, VCARS, and FLACC. No matter the brand, maker, or characteristics of the VR gadget, everyone nevertheless acknowledges the value of the VR headset in lowering dental fear [23].

The age ranges considered in this investigation were 5 to 10 years, which was also the case in the study by Ram et al. Even though the sample was made up of young people, they were of legal age to fill out the questionnaire used to gauge their own level of anxiety and to participate in the visual Facial Image Scale test. In addition, without their parents present and in the presence of bad scents and strange objects, kids were able to comprehend how to operate the VR headgear and refrain from feeling intimidated or scared by concealing their eyes in front of strangers [24]. Child hypnosis may be another sort of treatment to ease anxiety and enhance behavior, while this is still not proven. One of the first authors to think about music as a stress reliever was Hugly et al. Furthermore, it promotes relaxation by causing muscle hypotonia [84]. Contrarily, other research found that using music as a diversion is ineffective for reducing pain or anxiety or for altering behavior. Magic tricks are mentioned by Peretz et al. as a potential substitute to loosen the atmosphere and promote kid collaboration [25-27].

Our study's second goal was to evaluate behaviors. As was the case in this study, some writers, including Hoge et al and Ram et al, have discovered less disruptive behavior in their experimental groups. The study by Sullivan et al. on a sample size of 26 patients, in contrast, did not discover statistically significant differences between the experimental and control groups in terms of anxiety and managing behavior when utilizing VR headsets during dental treatment [28-30].

4. Conclusion

Distraction Strategy seems to solve the dental anxiety related quality of Life among children. The use of this scale could help clinicians, researchers and policy makers to interpret the dental anxiety related issues. It can help the family members to plan their children ‘s dental treatment challenges accordingly. It can help to compare and evaluate the anxiety status among children in India with those abroad at the community level. Further studies need to be planned and conducted in future to compare and evaluate the psychometric characteristics of dental anxiety.

Acknowledgments

We would like to thank the patients, parents and school authorities for their cooperation in completing the work.

Financial support and sponsorship

Nil

Conflict of Interest

Nil

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