Impact of Pictorial Story on Pain Perception, Situational Anxiety and Behavior in Children: A Cognitive-Behavioral Schema

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Aim: *The present study evaluated the effect of listening to a pictorial story about going to the dentist on pain perception, situational anxiety and behavioral feedback during dental treatment in pediatric dental patients.* ***Study design:*** *Eighty, 6-7-year-old children were included. The childhood anxiety-related disorders using Screen for Child Anxiety Related Disorders (SCARED) Parent Version scale and intelligence quotient using Raven's Progressive Matrices were evaluated. The subjects were randomly assigned to two groups, listening to a pictorial story about going to a dentist (test), or listening to a pictorial story about going to a barbershop (control). A dental treatment was performed on each subject, during which, behavior was assessed using Sound, Eye, and Motor Scale. Pain perception and situational anxiety were then assessed using Wong-Baker Fasces Pain Rating Scale and Faces version of the Modified Child Dental Anxiety Scale, respectively.* ***Results:*** *There was a significant decrease in pain perception (P= 0.02) and situational anxiety (P< 0.001) in the test group. In addition, the test intervention significantly improved children's behavioral feedback during dental treatment (P< 0.001).* ***Conclusion:*** *Preparation of children with pictorial story can be effective in decreasing pain perception and situational anxiety as well as improving behavior during dental treatment.*
Keywords: *pictorial story, pain perception, situational anxiety, behavior, intelligence quotient.*
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INTRODUCTION

Medical procedures including dental procedures can induce stress, anxiety and pain in children.[1] Approximately 20% of children have dental fears and 21% exhibit negative behaviors in the dental settings.[2] Increased anxiety can increase pain perception in children and may be a barrier to receiving the necessary dental care.[3] Children undergoing dental procedures often display crying, screaming, groaning, and verbalization of anxiety and pain. In these stressful conditions, it is helpful to use preventive preparatory interventions, which might disrupt a cycle whereby the painful experience leads to negative memories, which can produce greater anxiety and pain response. [4]

There are various approaches to managing the dental anxiety and fear. One of them is based on social learning theory and includes providing preparatory information for the child patient, which can reduce pain perception and distress during dental procedures.[5] Application of procedural information can be more effective if it is coupled with sensory information.[6] Another approach to increasing the cooperation of young dental patients is modeling , which involves the use of live models or specially-produced films.[7] Melamed and Siegel reported that children who watch the film preoperatively demonstrate reduced stress and significantly lower behavioral problems after hospitalization.[8] Providing information, sensory expectations, role identifications, rehearsals, and support, as related to the specific surgical procedure gave rise to significantly lower degrees of upset and more cooperation during hospital procedures in another study.[9] Cassell also concluded that preoperative puppet therapy relieved the situational anxiety produced by catheterization.[10] Exposure to positive images of dentistry reduced anticipatory dental fear and anxiety of children in one study.[11] However, previous exposure to dental information has not been effective on dental anxiety.[5,12] Reading or cognitive processing, though, might have some beneficial effects.[5]

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The storytelling has the potential to present information in both procedural and modeling forms, and in early childhood, it is a means to boost children's cognitive growth and development, to help them express and assign meaning to the world, to promote communication, recognition, and recall skills, and to reinforce their relationships with peers and adults.[13] In addition, it can be used for psychological preparation of patients before therapeutic processes and for psychotherapy of patients with phobia and severe anxiety disorders as a result of past therapeutic processes, which is referred to as cognitive behavior therapy (CBT).[14,15] The pictorial storytelling may play a greater role by combining verbal and pictorial media[16] Preparatory storytelling has been used as a means to improve children's knowledge of venous blood sampling and help them develop strategies to cope with the procedure.[15]

In studies providing preparatory information, child's comprehension—a function of intelligence quotient (IQ)[17]—and the presence of childhood-anxiety related disorders, or high-trait anxiety—significantly related with dental anxiety[18]—can be considered as confounding factors. Such studies should take an in-depth look at children's intellectual capacity and childhood-anxiety related disorders along with other evaluations. The present study was designed to determine the effect of a pictorial story about going to a dental office on children's pain perception, situational anxiety and behavioral feedback during dental procedures, considering intelligence quotient and childhood- anxiety related disorders.

MATERIALS AND METHODS

This study was carried out in the Department of Pediatric Dentistry at Tabriz University of Medical Sciences. Ethical approval for the study was obtained from the Research Ethics Committee of Tabriz University of Medical Sciences (Ref: 89.50). Data was collected between July and November 2010.

Study population

Eighty, 6-7-year-old children were included in the study. The subjects were consecutive series of new patients referred to the Department of Pediatric Dentistry for comprehensive assessments as well as routine dental treatments. A postgraduate student under the supervision of a pediatric dentist examined the subjects. A comprehensive medical and dental history was taken and a treatment plan was established for each patient. The subjects had no previous dental experience and no medical or psychological conditions requiring special care. These children had carious mandibular primary molars that needed to be treated under local anesthesia.

Children were excluded from the study if any of the following applied:Audiovisual impairment; Childhood-anxiety related disorders; History of unpleasant experiences in medical settings; History of dental pain secondary to pulpitis

Child's trait anxiety: Screen for Child Anxiety Related Disorders (SCARED) Parent Version, which was developed to identify symptoms of separation anxiety, generalized anxiety, panic disorder, obsessive-compulsive disorder, traumatic stress disorder, social phobia, specific phobia, and school phobia,[19] was used to assess childhood anxiety-related disorders of the subjects. A total score of ≥25 may indicate the presence of an anxiety disorders.

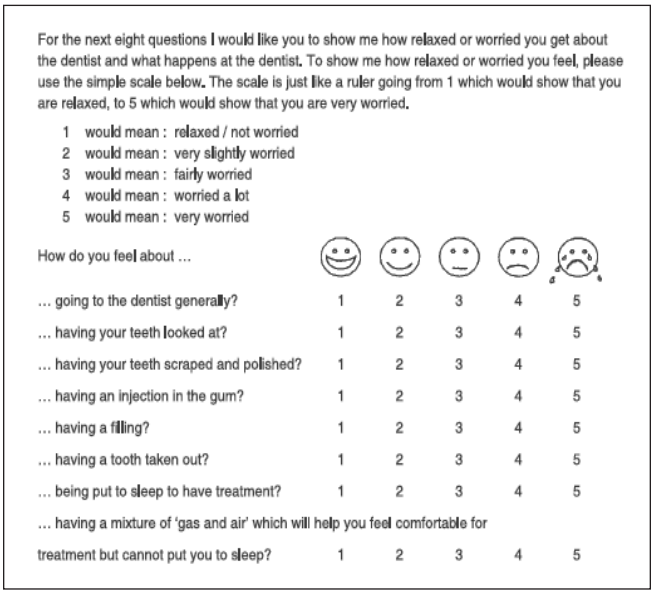
Child's intelligence quotient: Raven's Colored Progressive Matrices (Raven's CPM), which is probably the most widely used of all culture-independent tests,[20] was employed to assess the subjects' intelligence quotient.

Child's behavior: Sound, Eye, and Motor (SEM) Scale, which evaluates children's behavior during the procedure (Table 1),[21] was used to assess children's behavioral feedback during dental treatment. The subjects' responses were graded on a scale from 0 to 3, i.e. comfort, mild discomfort, moderately painful and painful, respectively.

Child's situational anxiety: Modified Child Dental Anxiety scale (MCDAS), which is a measure of dental anxiety in children, was used to assess the subjects' situational anxiety during dental treatment. It has an 8-question format, with a numeric rating scale ranging from 1 (relaxed/not worried) to 5 (very worried). Thus, the total score ranges from 8 to 40 (Figure 1). [22]

Table 1. Sound, Eye, and Motor (SEM) Scale description

Score	Designation	Sounds	Eye	Motor
0	Comfort	No sound indicating pain	No eye signs of discomfort	Hands, relaxed, no apparent body tenseness
1	Mild discomfort	Nonspecific possible pain indication	Eyes wide show of concern, no tears	Hands show some tension
2	Moderately painful	Specific verbal complaint e.g., Voice raised	Watery eyes	Random movement of arms/body grimace, twitch
3	Painful	Verbal complaint Indicates intense pain	Crying; tears running down the face	Movement of hands to make aggressive physical contact, pulling head away punching


For the next eight questions I would like you to show me how relaxed or worried you get about the dentist and what happens at the dentist. To show me how relaxed or worried you feel, please use the simple scale below. The scale is just like a ruler going from 1 which would show that you are relaxed, to 5 which would show that you are very worried.

1 would mean : relaxed / not worried
2 would mean : very slightly worried
3 would mean : fairly worried
4 would mean : worried a lot
5 would mean : very worried

How do you feel about ...					
... going to the dentist generally?	1	2	3	4	5
... having your teeth looked at?	1	2	3	4	5
... having your teeth scraped and polished?	1	2	3	4	5
... having an injection in the gum?	1	2	3	4	5
... having a filling?	1	2	3	4	5
... having a tooth taken out?	1	2	3	4	5
... being put to sleep to have treatment?	1	2	3	4	5
... having a mixture of 'gas and air' which will help you feel comfortable for treatment but cannot put you to sleep?	1	2	3	4	5

Figure 1. Modified Children Dental Anxiety Scale

Child's pain perception: Wong-Baker FACES Pain Rating Scale, which consists of faces from happy to tearful to demonstrate how a person might be feeling, [23] was used for the assessment of pain perception in the subjects during dental treatment.

Procedure

The study was a triple-blind randomized controlled trial. Neither the subjects nor the individuals carrying out the measurements, nor the statistician undertaking data analysis, knew which group the subject was in at the time of the trial or at the stage of data analysis. The study consisted of two sessions. In the initial appointment, a pediatric psychologist carried out psychological evaluations consisting of screening subjects for childhood-anxiety related disorders and assessment of intelligence quotient. Parents completed the SCARED Parent Version questionnaire according to the pediatric psychologist's instructions. If the child scored 25 or more in this questionnaire, which might indicate the presence of an anxiety disorder, he or she was excluded from the study. Subsequently, the same administrator conducted Raven's CPM testing. Parents had neutral attendance in that room and did not interact with their children during the test. The standard administration procedure, as described by Raven,[20] was used for the original book form. As suggested by Raven, no time limit was assigned for either task. Participants were required to select a piece from six alternatives, which completed the pattern for each item by pointing to their chosen response in the book form.

Before the second appointment, the subjects were randomly assigned to either the test group, listening to a pictorial story about going to a dental office, or the control group, listening to a pictorial story about going to a barbershop (neutral information). The stories for both groups were adopted from "Freddie's First Experienes" by Nicola Smee (Hachette Children's Books, 2003). This illustrated book series is especially designed for children above three years old with the aim of preparing them for new experiences. The two stories selected for the test and the control groups provided preparatory information and involved a social interaction between the child and an operator, who was going to perform a procedure on the child, i.e. a dental procedure, and a haircut, both of which have been shown to induce some degrees of anxiety in children. The story selected for the first group was about a child going to a dentist for examination and treatment for the first time in his life. At the end of the story, the child left the dental office with a smile and without any discomfort. The story selected for the second group was about a child who went to a barbershop for a haircut. The child left the barbershop happily after the haircut. The pictures for both stories had been prepared in PowerPoint computer software (Office 2003, Microsoft, USA) in the form of slides. A video projector was used for slideshow and the story was told simultaneously by a woman in a simple language in a friendly manner. The stories were told in approximately 10 minutes, to 2-3 children each time, for both groups. After listening to the story, one child at a time was led into identical dental operatory and sat on the dental chair. The walls of the dental operatory were decorated with posters of the characters of the famous cartoons. The chief pediatric postgraduate student then introduced himself to the child. A standardized 'tell, show and do' method was used for all the subjects; each instrument and task were described in a simple manner. This operator rendered identical dental treatments, which included prophylaxis at the beginning of the treatment followed by an amalgam restoration of one of the carious mandibular primary molars without pulp involvement and fluoride therapy at the end of the session. Topical anesthetic agent was applied using a cotton role for 30 seconds on the dried mucosa before the administration of the inferior alveolar block with 2% lidocaine containing 1:100000 epinephrine. During the treatment period, one of the parents was present next to the dental unit. Another dentist who was blind to the study assessed the child's behavior during the procedure according to the SEM scale. Situational anxiety using MCDAS Scale and pain perception using Wong-Baker Fasces Pain Rating Scale were evaluated at the end of the treatment.

Data analysis

Chi-square test was used to compare the two groups in relation to gender and *t*-test was employed to compare the two groups in relation to age, and child anxiety related disorders. ANCOVA (Analysis of Covariance) was used to compare pain perception, situational anxiety, and behavioral feedback between the two groups with IQ as a covariate variable. Statistical significance was defined at $P<0.05$. Data were analyzed using SPSS 13.0 software.

RESULTS

The subjects comprised 22 boys and 18 girls in the test group and 17 boys and 23 girls in the control group, with no statistically significant differences between the two groups regarding gender ($P=0.37$). In addition, there were no significant age-related differences between the two groups ($P= 0.50$).

Mean and Standard Deviation of study variables based on the study groups are shown in Table 2. The results of *t*-test did not demonstrate any significant differences between the two groups in SCARED score ($P=0.94$).

Table 3 summarizes the results of ANCOVA in relation to the comparison of pain perception, situational anxiety and behavioral feedback with IQ as a covariate variable. Results showed that the intensity of pain perceived by the subjects in the test group was significantly less than that in the control group ($p=0.02$, $F=5.595$). In addition, subjects in the test group exhibited statistically significant lower situational anxiety compared to the subjects in the control group ($P<0.001$, $F=271.024$). The mean SEM scores were 3.58 (SD=0.74) and 6.03 (SD=1.95) in the test and control groups, respectively, demonstrating statistically significant differences ($P<0.001$, $F=57.002$).

DISCUSSION

The present study was designed to determine the effect of a

Table 2. Mean and SD of study variables based on groups

Group	N	Mean	Std Deviation
SCARED score			
Test	40	17.00	0.282
Control	40	17.03	0.274
IQ score			
Test	40	104.45	1.485
Control	40	104.80	1.641
Pain score			
Test	40	1.00	0.129
Control	40	1.48	0.152
MCDAS score			
Test	40	16.00	0.297
Control	40	25.35	0.476
SEM score			
Test	40	3.58	0.118
Control	40	6.03	0.309

SCARED: Screening of Child Anxiety Related Disorders Scale
IQ: Intelligent Quotient
Pain: Wong-Baker FACES Pain Rating Scale
MCDAS: Modified Children Dental Anxiety Scale
SEM: Sound, Eye, and Motor Scale

pictorial story about going to a dental office on children's pain perception, situational anxiety and behavioral feedback considering intelligence quotient and childhood-anxiety related disorders during dental procedures. The results of the present study showed that preparatory information in the form of telling a pictorial story to the subjects before dental procedures can decrease situational anxiety and the pain perception during treatment. In addition, children who had listened to a story about visiting a dentist before dental treatment demonstrated better behavioral feedback compared to those who had listened to a story about going to a barbershop, which provided children with neutral and unrelated information in relation to dentistry.

Various studies have been carried out on providing preparatory information in order to decrease stress and anxiety during medical and dental procedures. These studies have attempted to prepare individuals for stressful treatment procedures through decreasing anxiety and increasing cognitive and physical coping responses.[24] Different techniques have been suggested to prepare patients, one of which is providing objective information about what will happen during the procedures, referred to as procedural information. Another technique for preparing the patients is the provision of sensory expectation, which simulates the sensation the patient will experience during the procedure. Coping instruction is another preparation method, which attempts to train the patient so that the patient can overcome their stress and pain during treatment. Finally, modeling is another technique in which depicting and showing a person who has undergone the procedure with no side effects and complications will help decrease stress and fear of the individual involved.[24]

Table 3. The results of ANCOVA in relation to the comparison of pain perception, situational anxiety and behavioral feedback with intelligent quotient (IQ) as a covariate variable

Variables	F	p-value
Pain	5.595	0.021
MCDAS	271.024	<0.001
SEM	57.002	<0.001

Pain: Wong-Baker FACES Pain Rating Scale
MCDAS: Modified Children Dental Anxiety Scale
SEM: Sound, Eye, and Motor Scale

Among these techniques, the simplest patient preparation method is providing procedural information, which can have a limited positive effect on fearful patients. The effect of this technique increases when coupled with other methods. Sensory expectation is a more effective technique than procedural information; however, when it is coupled with coping instructions, a greater effect on patient stress decrease will be observed.[24] Coping instructions technique, either in the form of relaxation and physical exercises or cognitive techniques, is a more effective method in preparing patients to face stressful situations.[24,25] Modeling is the most common technique for preparing children for treatment procedures,[24] which can be presented in various forms, including live models, and custom-made films and videotapes for each treatment process.[7]

Folayan and Idehen provided procedural information about dentistry to children before dental visits to reduce their dental anxiety and reported no influence on reducing stress in children undergoing dental procedures.[12] Funmi and Olumide provided positive dental information in the form of leaflets and reported no significant decrease in children's dental anxiety, either.[5] In contrast, Fox and Newton reported significant decrease in children's dental anxiety with the use of positive images to prepare children before dental visits, which is an example of the modeling technique.[11]

Stories, which are fundamental parts of a child's culture, make the strange world of therapy more comfortable for them. Metaphors and stories in cognitive behavioral therapy (CBT) make the therapeutic methods more accessible and facilitate cooperation on behalf of the children. Stories and metaphors provide young children with the opportunity to experience therapeutic concepts and procedures in a developmentally sensitive way. When treatment procedures become more accessible, it is more likely that children will incorporate them.[14] The use of a pictorial story before the treatment process can increase children's attention to the presented information through the interaction of child with the story, with a subsequent increase in comprehension of the impending therapeutic procedure compared to films, video tapes or live models, which are considered modeling methods. Telling a story about going to a dental office and stimulating the dental procedure ahead, may influence the efficacy of 'tell, show, and do' method during treatment and enhance the relationship between the dentist and child during the first treatment session.

In fact, the technique used in the present study was a combination of both modeling and procedural information techniques. The information provided by the story was compatible with the treatment procedure the children were to undergo, and could have a positive effect on the results. Green *et al*, who used film modeling to prepare children and improve their dental behavior, attributed the failure of their intervention to the ineffectiveness and lack of relationship between the information presented and the treatment protocol ahead to modify child behavior.[7]

The results of the present study showed that telling a pictorial dental story could have a positive effect on pain perception, situational stress and behavior during dental procedures. All these three factors are interrelated and can influence each other because it has been shown that with an increase in anxiety, there is a parallel increase in pain perception in children undergoing dental procedures, which in turn results in negative behaviors. Stress and anxiety initiate this vicious circle.[1]

The presence of childhood-anxiety related disorders is an important factor influencing situational anxiety; a factor that seems to have been ignored in previous studies on psychological preparation of children before therapeutic processes. Situational anxiety is a transitory emotional condition, with varying intensities and fluctuations over time, whereas trait anxiety is a personality trait, with relative stability over time.[26] Akarslan *et al* reported that general trait anxiety and dental anxiety, although distinct phenomena, can influence each other, and patients with higher levels of trait anxiety experience higher dental anxiety during dental procedures.[27] It has been demonstrated that children who have a high SCARED score will have a high level of trait anxiety.[28] In the present study, a high level of trait anxiety was considered a criterion to exclude the subjects due to its confounding effect on situational anxiety.

An important cognitive factor, which can have a great role in learning, comprehension, and knowledge acquisition, is intelligence quotient (IQ), which has been referred to as "psychometric measure of general intelligence" in several studies.[17] The subjects' IQ was considered as a covariate factor in evaluating study outcomes to eliminate the effect of this confounding factor because the subjects had different IQ levels. This way, the effect of IQ on the child's comprehension was eliminated and the effect of the pictorial story was highlighted.

In this study, children's positive responses to stressful dental procedures were supposedly related to the use of cognitive processing. Unfamiliarity or lack of information about the dental setting is a major determinant of psychological distress associated with pediatric dental treatments. Our preoperative cognitive intervention familiarized the children with the dental setting, which enhanced children's self-generated coping strategies. Psychological preparation of children by pictorial stories specific to the dental procedure aims at training them to cope with the therapeutic situation ahead. Therefore, it is possible for the dental staff or parents to tell pictorial stories related to the dental therapeutic processes before the treatment session to increase self-regulation and coping skills so that they will be able to overcome their situational anxiety and demonstrate better behavioral feedback.

CONCLUSION

The present study showed that telling a pictorial story about going to the dentist before dental procedures, which is based on the social learning theory, decreases children's dental anxiety, reduces pain perception and eventually improves children's behavioral feedback by providing procedural information coupled with modeling during dental treatment.

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