Usage of a Reward System for Dealing with Pediatric Dental Fear

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Abstract

Background: Pediatric dental fear, if left unchecked, can persist for a lifetime and adversely impact the physical and psychological health of a patient. In this study, a feasible nonmedical method for relieving pediatric dental fear was investigated.

Methods: A randomized, single-blind, controlled trial model was applied. The juvenile patients experiencing dental fear, whose parents or guardian had signed an informed consent form, were randomly divided into two groups. Group A ($n = 50$) was the control group, while Group B ($n = 50$) was the reward group. Participants in Group A accepted routine treatment. Participants in Group B were told that they would obtain a gift as a reward for their good behavior if they were compliant during their dental treatments. The Chinese version of the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) was used to evaluate the level of dental fear of each patient both before and after each treatment. A contrast analysis and a correlation analysis of the results were used to assess the efficacy of the reward mechanism.

Results: All participants in Group B, were obedient during the dental treatment, and they also successfully chose the present they wanted at the end of their dental treatment. Children at different ages showed different reward preferences. Significant difference in the fear scores of the participants in Group B before the treatment and after receiving the reward was found (independent samples t-test, $t = 14.72$, $P < 0.001$). In Group A, 86% children's fear score did not undergo a noticeable change.

Conclusions: A reward system is proved feasible to relieve pediatric dental fear, and the form of reward should meet the demand of patients.

Key words: Nonmedical Way; Pediatric Dental Fear; Reward Mechanism

INTRODUCTION

Dental fear (odontophobia) is a unique phobia with special psychosomatic components that impact the dental health of those who suffer from it, and there is also an association between dental fear and general fears.[1] Symptoms of dental fear include abnormal physiological and psychological reactions toward dental treatments. According to epidemiological research conducted in several countries in 2009, the incidence rate of dental fear is 36%.[2] Norman *et al.*'s[3] research showed approximately one in ten people might refuse dental treatment due to fear. In addition, the incidence rate of pediatric dental fear[4] is higher than that of adult[5] dental fear. Therefore, the estimation and remission of pediatric dental fear are vital for the practice of dentistry.

Current research has mainly focused on the etiology and the influential factors contributing to dental fear and anxiety. For example, oral hygiene conditions, the sound of drill, fear of pain, the acquired avoidance of the hospital,[6] and the satisfaction level of treatment are factors that have been widely investigated.[7] Some studies have focused on the treatment of dental fear through the use of anesthesia and

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medication. In addition, the use of state of the art Virtual Reality Exposure Therapy (VRET) has been found to be useful for treating dental phobia among adults.[8] However, nonmedical treatment for the pediatric dental fear is still rarely studied, and no research has yet addressed the pediatric population using a cross-over study between dentistry and social psychology. Thus, we proposed a reward system to reduce dental fear in children based on principles from social psychology. The reward system for relieving dental fear is justified by proper psychological theories as well as our trials. The aim of the present study was to determine the efficacy of a reward system, as well as provide a possible alternative treatment for pediatric dental anxiety and phobia.

METHODS

Study design

We used a randomized, single-blind, controlled trial to validate the reward system for relieving pediatric dental fear. A total of one hundred children with dental fear were randomly divided into two groups (n=50 in each group). Group A was the control group, while Group B was the reward group. All children required dental treatment. For the trial, we used the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) to assess pediatric dental fear.[9] Patients in Group A were routinely treated without being informed of the possibility of a reward, while patients in Group B were informed that they will obtain a reward if they are compliant. All of the pediatric patients in Group A and Group B were given routine dental treatment by the same dentist. Afterward, the level of dental fear in the participants was measured again using CFSS-DS. We compared the results before and after dental treatment to measure the efficacy of the reward system and used a correlation analysis to study the factors which influenced the choice of reward.

Sampling and data collection

All new pediatric dental patients who sought dental treatment at the Stomatology Department of the First Hospital affiliated to Harbin Medical University from December 2014 to February 2015 were invited to participate. If the patients and their parents or guardians agreed to join the trial, before the dental treatment, a brief inclusion questionnaire was made to judge whether the patients were qualified for the trial. The inclusion criteria that participants should satisfy were as follows: 1) An age between 3 to 12 years old; 2) In need of dental treatment; 3) Presenting with dental fear or anxiety; 4) Patients Speaking Chinese as mother tongue and being able to listen and understand illustration in Chinese; 5) The guardians or the parents of the patients being able to read, understand and complete the Chinese version of CFSS-DS; 6) Having not undergone any intervention of dental fear and anxiety before, and the exclusion criteria were as follows: 1) Diagnosed with any mental disorder, acute or chronical physical disease other than dental disease; 2) Unwilling or unable to participate in the trial due to any possible reason; 3) Patients with a CFSS-DS score lower than 35. The study was explained to the parents or guardian of the qualified patients in order to obtain consent.

A consent letter was signed. If the participation was inclined, the patient would be excluded. Random number tables were used for randomization. In a table of 1000 random digits, we randomly chose a starting point in the table, numbered the patients by the order of coming to the hospital and allocated subjects corresponding to odd digits to Group A, and those corresponding to even digits to Group B.

The CFSS-DS was given to the participants before and after the dental treatment. The experimenter and/or the parents provided assistance to the children in order to complete the scale. The CFSS-DS exclusively evaluates children's dental fear. Previous research has shown that compared to the Venham picture test and Corah's Dental Anxiety Scale (DAS), the CFSS-DS is more accurate and reliable. Therefore, the CFSS-DS is commonly used in clinical trials.[10] The CFSS-DS scale is comprised of 15 items related to various aspects of dental treatment, and each of the items is rated on a 5-point Likert scale. The total score of CFSS-DS is between 15 and 75. In general, the higher one's score, the greater one's fear. In our study, patients who scored >35 were defined as having dental fear. Thus, if the CFSS-DS score was below 35, the patient would be excluded.

The Chinese version of CFSS-DS is adapted from the English version. A previous study has confirmed the validity and reliability of Chinese CFSS-DS.[11] Therefore, the Chinese version of the CFSS-DS was used in this study.

Design of the reward system

Participants in Group B were told that if they were calm and did not refuse dental treatment, they would receive a reward for their compliance. The reward system was presented by the dentist in a tender voice and in an understandable way after the questionnaire and CFSS-DS were completed. After the dental treatment occurred, participants who were compliant during the treatment could choose a reward from the following choices: a pencil eraser, a cartoon sticker, or a small notebook. Their selection was recorded by an assistant. The correlation between their choice and other factors was further studied. In contrast to participants in Group B, participants in Group A did not receive a reward.

Statistical analysis

Data were expressed as n or mean ± standard deviation (SD). Independent sample t-tests, and chi-square test were applied to analyze the trial data. The statistical analysis was performed using the software package SPSS 17.0 (IBM Corporation, New York, USA). Correlation between the variables was judged based on a significance threshold of $P < 0.05$, which indicates strong evidence against the null hypothesis.

RESULTS

Participant characteristics

As shown in Table 1, the one hundred participants ranged from 3 to 12 years old. There were 54 boys and 46 girls. No statistical differences in the incidence rate of pediatric dental fear between the two groups were found for gender (Chi-square test, $x^2 = 0.161$, $P = 0.688$) or for age (two-sample t-test, $t = 0.633$, $P = 0.528$).

Efficacy of the reward system

The participants in Group A and Group B received appropriate dental treatment according to their symptoms. There was no evidence that indicated that the level of pediatric dental fear was related to the treatment method. In addition, there were no significant statistical differences for the effect of reward based on gender or age as shown in Table 1.

In Group B, we observed that the participants who were aware of the reward system stopped crying and were obedient. At the end of the trial, all participants in Group B were successful and obtained the reward that they had selected. Based on our analysis of the results of the CFSS-DS, the mean fear score in Group B declined after the treatment. The difference in the fear scores of the participants in Group B before the treatment compared to after receiving the reward was significantly different (independent samples t-test, $t = 14.72$, $P < 0.001$). The CFSS-DS score of approximately 96% (48/50) of the participants was reduced to 35 or less at the end of the dental treatment. Among the fifty pediatric subjects, only two children had scores higher than 35. However, their CFSS-DS scores were as high as 72 before treatment. After the reward system was introduced, their scores were 37 and 38. Thus, their scores also dropped remarkably due to the reward system. However, the mean fear score of the participants in Group A, who received the same routine treatment but without the reward system, dropped slightly after the treatment. The statistical data are shown in Table 2. In Group B, seven children's scores were <35 after receiving the reward. However, the other participants' scores were still high.

Choice of the reward

Children's choice of reward is shown in Table 3. Preschool children (3 to 6 years old) mostly chose stickers. 95.2% (20 of 21) chose stickers as the reward they might get after the treatment, while 4.8% (1 of 21) chose the pencil eraser and no one chose the small notebook. In the age group of 7 to 9 years old, 64.3% (9 of 14) chose the pencil; 7.2% (1 of 14) chose the sticker and 28.5% (4 of 14) chose the small notebook. In the age group of 10 to 12 years old, 26.7% (4 of 15) chose the pencil eraser; 13.3% (2 of 15) chose the sticker and 60.0% (9 of 15) chose the small note book.

DISCUSSION

Pediatric dental fear usually manifests as crying, floundering, refusal of treatment, or aggressive behavior. Related studies have indicated that patients with pediatric dental fear avoid dental treatment and have a high prevalence rate of cavities.[12] In comparison with adults and teenagers, advance discussion of the dental treatment is less effective at relieving pediatric dental fear. Evidence from clinical practice indicates that noncompliance with treatment might result in mucosal trauma. In addition, because children are in a period of physiological development, cavities and other dental diseases without proper treatment are detrimental to their physical and mental health. Therefore, the study of pediatric dental fear is vital and necessary.

In terms of pediatric dental fear, we found no obvious differences based on gender, consistent with Freeman's research on the relationship between gender and dental fear.[13] Our investigation showed that pediatric dental fear can be effectively reduced by using a reward system. The participants in Group A and Group B experienced similar levels of dental fear before treatment; there were no statistical differences in the initial dental fear levels between the two groups. One can infer that the difference in mean dental fear levels between Group A and Group B after treatment is a result of the reward system. We propose that most participants in Group B overcame their dental fear when they received a reward.

The proposed reward system is based on dynamic field theory, an important concept drawn from Kurt Lewin's psychological theories. According to Lewin's dynamic field theory,[14] one's actions are mainly driven by one's intentions. Once the demand of completing a task is generated, the consequent intention is created. This intention builds a psychological tension, which is released when the intended task is completed.[15] Therefore, one's action can be aroused by proper motivation. Participants in the reward group were motivated to obtain the reward by behaving well. In our study, their behaviors changed from the

Table 1: Characteristics of trial participants

Characteristics	Group A (control group, $n = 50$)	Group B (reward group, $n = 50$)	t/χ^2	P
Mean age (years)	7.28 ± 2.36	7.34 ± 2.69	0.633*	0.528
Mean age of boys (years)	7.32 ± 3.18	7.33 ± 2.41	−0.018*	0.986
Mean age of girls (years)	7.25 ± 2.29	6.62 ± 2.30	−0.048*	0.080
Gender (male/ female), n	22/28	24/26	0.161†	0.688

Values are expressed as the mean ± standard deviation (SD) or n. *t-test was used to test the difference in age between the different groups. †Chi-square test was used to test the difference in gender between the two groups.

Table 2: Change in the score of the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) before and after the dental treatment in the two groups

Groups	Mean score before treatment	Mean score after treatment	t	P	Percentage of participants' CFSS-DS score below 35 after treatment, n (%)
Group A (Control group, $n = 50$)	50.28 ± 10.69	46.22 ± 11.86	−0.398	0.345*	48 (96.0)
Group B (Reward group, $n = 50$)	51.12 ± 10.47	25.98 ± 5.94	14.724	<0.001*	7 (14.0)

Values are expressed as the mean ± standard deviation (SD) or n (%). *Two-sample t-test was used to compare the differences between the mean CFSS-DS score before and after the treatment. In Group B, P-value indicated a significant correlation between the reward system and the change in the sore of CFSS-DS at the 0.001 level.

Table 3: Participants' choice of reward in reward group, *n*

Age (years)	Pencil eraser (*n* = 14)	Sticker (*n* = 23)	Small notebook (*n* = 13)	Total (*n* = 50)
3–6	1	20	0	21
7–9	9	1	4	14
10–12	4	2	9	15

refusal of treatment or crying to being still and overcoming their fear. Our statistical results are consistent with the predictions of this psychological theory.

The statistical results in Table 3 indicate that the participant's age largely predicts which reward will be favored. Usually preschool children (3–6 years old) obtain stickers from their teachers in kindergarten when they behave well, and stickers are popular gift among them. This accounts for the fact that children in this age group preferred stickers to pencil erasers and small notebooks. Primary-grade students in elementary school (7–9 years old) in China are required to write in pencil. Therefore, the pencil erasers are always a favorite and necessary for them. They regard collecting stickers as childish. Senior students (10–12 years old) in China are usually advised to write in ink. Therefore, the pencil eraser is not of use to them and a small notebook is usually chosen. It is important for the design of the reward system that one considers the participant's characteristics and needs.

With modern advances in medicine and medical instruments, the pain experienced during dental treatment is not usually as severe as people imagine it will be. The fact that pain is a main cause of dental fear could account for our observation that dental fear in a few participants in Group A was slightly lower after the treatment.[16] However, only a few dental patients could reduce their fear in this way. Therefore, additional measures should be applied to reduce pediatric dental fear.

Various measures are currently used to reduce pediatric dental fear. Nitrous oxide is commonly used for fearful children during treatment.[17] In terms of the calming effect, local anesthesia and analgesia are effective methods. Nevertheless, anesthesia and analgesia usually lead to prolonged treatment and increased cost, and even cause fear of local anesthetic injection.[18] Therefore, we advise that anesthesia and analgesia should only be applied when nonmedical methods are invalid. The reward system is recommended and can be combined with other nonmedical methods, such as scent therapy,[19] to relieve dental fear.

The study findings suggest that reward is viable for relieving pediatric dental fear, but the reward system needs to be further refined and tested with a more diverse sample of children. Thus, future work remains in getting better understand of children's psychology and enabling the design of more effective systems of reward.

In conclusion, we propose a reward system, which is the Chinese version of the CFSS-DS, to relieve pediatric dental fear based on Lewin's psychological theory. In this reward system, the participant will obtain a reward for their compliance during dental treatment. Hence, the reward system can reduce pediatric dental fear and anxiety to make the dental treatment run smoothly, and the form of the reward should meet the needs of patients of different ages.

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Conflicts of interest

There are no conflicts of interest.

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