Children's Preferences Concerning the Physical Appearance of Dental Injectors

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ABSTRACT

Purpose: This pilot study was carried out to assess how the physical appearance of dental injectors influenced children's choice.

Methods: The study group consisted of 34 randomly selected children (17 boys, 17 girls) between the ages of 7 and 11 (mean age=8.6±1.4), who had been registered for treatment at the School of Dentistry, Marmara University. A combination of tests—the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS), Venham Picture Test (VPT), and facial image scale (FIS)—were used to assess the multi-dimensional character of children's dental anxiety. Dental injectors (Wand, Citoject, traditional metal injector [MI], and plastic injector [PI]) were displayed on a tray and introduced to the children. The children were asked to consider which injectors they would choose "if their tooth had to be put to sleep," and their preferences were noted starting with their first choice.

Results: The children's first choice was: (1) the Wand (56%); (2) PI (29%); (3) Citoject (12%); and (4) MI (3%). The anxious children (n=13) preferred the Wand with significantly higher ratings (Wand=84%; Citoject=8%; MI=8%; PI=0%).

Conclusion: The physical appearance of dental injectors is important to children and even more important for children who are anxious. (J Dent Child 2006;73:116-121)

KEYWORDS: DENTAL ANXIETY, DENTAL FEAR, INJECTOR, BEHAVIOR MANAGEMENT, DENTAL ANXIETY SCALES, CHILDREN, PREFERENCE, CHILD FRIENDLY

To varying degrees, anxiety and fear are present in the minds of many patients during dental procedures.[1] There is a high correlation of adult fear and avoidance originating from childhood dental experiences.[1-3] Although many children seen in clinical practice are very cooperative, nearly 1 in 4 present themselves to dentists with some type of management challenge. Among these children, it is difficult to differentiate between fear- and anxiety-originated behavior problems. It is clear, however, that for both children and adults the most anxiety-provoking procedure is the local anesthetic injection.[2-6]

Various techniques have been used to reduce pain during the injection of local anesthetics. Some of them are behavioral, such as reframing and using distraction and suggestions.[7,8] Other techniques have used instrumental approaches such as the application of topical anesthetic gel or patches prior to injection, or electronic computerized devices such as the Wand. Also, techniques have been suggested to ease the discomfort of intraoral injections, which have required a prolonged injection time or warmed-up anesthetic solution. None, however, have been able to cope totally with the pain connected with injection.[1,2,6,9-11]

There is a strong relation between pain and anxiety. Painful dental operations cause fear, whereas fear and anxiety increase the amount of perceived pain.[12] The physical appearance of treatment instruments may provoke anxiety in the dental environment. Thus, dental injectors can be seen as anxiety-provoking instruments, resulting in higher pain perception. In research studying cognitive development in childhood, age-related different behavior models are described during the experience of pain. Developmental changes in the reactions of children to painful stimuli are observed in early childhood. Children start to develop fear in response to painful stimuli between 6 to 18 months and to sharp objects around the first year.[4,13]

The dental literature lacks studies about the effects of dental injectors' physical appearance on anxiety and pain. The term "physical appearance" is mentioned only once in a chapter named "local anesthesia in children," which described jet injectors and some intraligamental anesthesia pistols as "visually less frightening or nonthreatening" objects.[14]

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There are few studies in the medical literature which consider and research "children's preferences" during their treatment. One study, however, asked children about their topical anesthetic preference prior to treatment. The authors discovered that 60% of subjects made their choice based on physical appearance.[15]

Different injectors may evoke different feelings according to their appearance and some may be preferred by children on the basis of their "child friendly" character. The aim of this pilot study was to assess the influence of the physical appearance of dental injectors on children's choice.

METHODS

PARTICIPANTS

Thirty-four healthy children ranging in age between 7 to 11 years (mean age=8.6±1.4) participated in this pilot study. The study group consisted of a randomly chosen group of 17 boys and 17 girls who had been registered for treatment at the School of Dentistry, Marmara University, Istanbul, Turkey. The parents were asked about their children's previous experience of dental injection. The procedure and the aim of the study were also explained to the parents, and verbal consent was obtained from them.

PROCEDURE

The Children's Fear Survey Schedule-Dental Subscale (CFSS-DS), Venham Picture Test (VPT), and Facial Image Scale (FIS) were used to assess children's preliminary anxiety.[16-19] The study was wholly conducted by the same researcher. Prior to treatment, the tests were explained to every child and then performed in the same order. Four different dental injectors (the Wand, Citoject, traditional metal injector [MI], and plastic injector [PI]), were randomly displayed on a tray and introduced to the children (Figure 1). The children were asked to consider which injectors they would choose "if their tooth had to be put to sleep," and the answers were noted in the order of their preferences, starting with their first choice.

INSTRUMENTATION

The CFSS-DS is a revised form of the Children's Fear Survey Schedule and consisted of 15 items which were rated on a Likert scale, ranging from 1 (not afraid) to 5 (very afraid). Thus, the total score on the CFSS-DS can range from 15 to 75 and represents trait anxiety of children, including dental situations. Previous research has defined scores between 32 and 38 as "mild dental anxiety and fear" and scores of 39 and higher as "high dental anxiety and fear." The reliability of CFSS-DS is high and it has a moderate validity.[16,20]

The VPT is a self-report instrument for state anxiety, using 8 pictured cards with 2 figures on each—one "anxious" figure and one "nonanxious" figure. The child is presented with 8 pairs of pictures and is asked to choose the one which best reflects his own emotions. If the child chooses the "anxious" figure, he/she gets an anxiety score of 1. If the child chooses the "nonanxious" figure, he/she gets an anxiety score of 0. The anxiety scores are then added, and the total anxiety score is calculated between 0 and 8. The VPT has moderate validity, but has questionable reliability—thus needing further study.[16,18]

Figure 1. Injectors displayed to the children.

Another self-report instrument for state anxiety is the FIS, which has 2 rows of 9 faces ranging from "very happy" to "very unhappy." The children are asked to indicate which face represents their feelings most at that moment in time. The scores of dental anxiety range between 0.04 (nonanxious/happy) to 0.97 (very anxious/unhappy). FIS has a moderate validity, and no cutoff points have been mentioned for FIS and VPT in the literature.[18]

In many studies, different instruments for the assessment of dental anxiety have been used in combination. Underlying the multitude of measurement techniques is the general idea that dental anxiety is a multidimensional construct, consisting of a behavioral, cognitive, and physiological component within a generalized or situational context.[16]

Therefore, in this study a combination of 3 different self-report anxiety tests were used to record both the state and trait aspects of dental anxiety. Children scoring above the mean anxiety scores in at least 2 of the 3 tests performed were considered to be anxious.

STATISTICAL ANALYSIS

Statistical analysis was performed with the GraphPad Prisma V.3 program (Graph Pad Software, San Diego, Calif). Parameters were evaluated by Pearson chi-square analysis and Cronbach alpha coefficients were calculated for the reliability of the tests. Significance was set at $P<.05$.

RESULTS

The Wand was the first preference for 56% of the children, followed by the PI (29%). The MI was the most nonpreferred injector (42%), and the PI was the second most nonpreferred (36%; Table 1; Figure 2).

Of the 34 children tested, the mean CFSS-DS score was 33.9±11.2, and 12 children scored higher than this mean

anxiety score. The mean scores were 1.08±1.3 for VAS and 0.29±0.1 for FIS, and 13 and 19 children, respectively, scored above these mean values (Cronbach alpha coefficients for CFSS-DS and VAS are 0.80 and 0.51, respectively).

In total, 13 children (7 boys, 6 girls; Table 2) were diagnosed as anxious (38%) and 21 children (10 boys, 11 girls) were diagnosed as nonanxious (62%), according to the criteria previously mentioned in the methods section under instrumentation. There was not a significant difference in number between anxious boys and girls (*P*=.724).

The first preferences of the anxious and the nonanxious group were significantly different (*P*=.011) from each other (Table 3; Figure 3). Most of the anxious children (84%) preferred the Wand, some of them chose Citoject (8%) and the MI (8%), but none of the anxious children preferred the PI (0%). Among the nonanxious children, the PI and the Wand were preferred by 48% and 38% of the children. The MI was the least preferred injector (3%) for both groups (Table 3).

When the relationship between nonpreferred injector and anxiety was examined, 52% of the nonanxious children disregarded the MI while 58% of the anxious children disregarded the PI. Over 42% of the children did not choose the MI, and 36% of the children did not prefer the PI if their tooth had to be put to sleep (*P*=.252).

Among the children who experienced local anesthesia (n=20), statistically significant relations (*P*=.024) were discovered between the first preferred injector and the anxiety levels. Nonanxious children who experienced local anesthesia (n=14) preferred the PI (57%) as their first choice, whereas the anxious children who experienced local anesthesia (n=6) preferred the Wand (83%) and did not prefer the PI (Table 4).

Among the children who did not experience local anesthesia (n=14), the Wand was the first preferred injector for both the nonanxious group (57%) and anxious group (86%). The PI was preferred by 29% of the nonanxious group, but was not preferred by the anxious group (*P*=.301; Table 4).

None of the children disregarded the Wand, whereas the MI and PI were disregarded by, respectively, 46% and 39% of the children who previously had no local anesthesia experience(*P*=.672). In the group of children who had earlier experienced local anesthesia, the disregarding rates for the MI and PI were 40% and 35%, respectively (*P*=.213).

DISCUSSION

Many instruments are used in dentistry, and most of them are described by patients as "scary" and "frightening." In the present pilot study, the aim was to assess the influence of physical appearance on children's choice of dental injectors.

In the dental literature, there is no study about the effects of dental injectors' physical appearance on pain and anxiety. It is known, however, that pain and anxiety are strongly related to each other in that anxiety increases the amount of perceived pain and, likewise, pain increases the anxiety level.[12]

A threatening dental injector may easily create anxiety in children, decrease their pain threshold, and result in the treatment being interrupted by a painful cry. For this reason, it was intended to determine—on the basis of preference from 4 different injector models—which were the least threatening and the most threatening.

In this study, the Wand was the least threatening injector, while the MI was the most threatening injector on the basis of most and least preferred (Table 1). When it was thoroughly analyzed in Table 1, it was discovered that the PI was both the second least threatening (after the Wand) and the second most threatening (after MS) of the 4 displayed injectors.

Table 1. Preference Ratings for the Injectors Displayed to the Children

	First preference		Second preference		Third preference		Nonpreferred injector	
	n	%	n	%	n	%	n	%
Wand	19	56	7	21	4	12	3	9
Plastic injector	10	29	6	18	5	15	12	36
Metal injector	1	3	6	18	12	36	14	42
Citoject	4	12	14	42	12	37	4	12
Total	34	100	33*	100	33*	100	33*	100

One child indicated only his first preference, didn't consider the other 3 injectors.

Table 2. The Anxious Children and Their Anxiety Test Scores*

			VPT	FIS	CFSS-DS
	Patient no.	Gender	Mean=1.08±1.3	Mean=0.29±0.1	Mean=33.9±11.2
1	1	F	4†	0.47†	53†
2	2	F	2†	0.59†	29
3	8	M	3†	0.37†	33
4	14	M	5†	0.17	57†
5	16	F	2†	0.47†	39†
6	17	F	2†	0.47†	49†
7	19	M	2†	0.59†	31
8	24	M	2†	0.47†	43†
9	25	M	2†	0.37†	41†
10	26	F	3†	0.59†	39†
11	28	M	0	0.47†	47†
12	32	M	3†	0.47†	47†
13	33	F	2†	0.47†	29

VPT=Venham Picture Test; FIS=Facial Image Scale; CFSS-DS=Children's Fear Survey Schedule–Dental Subscale.
†Scores above the mean anxiety values.

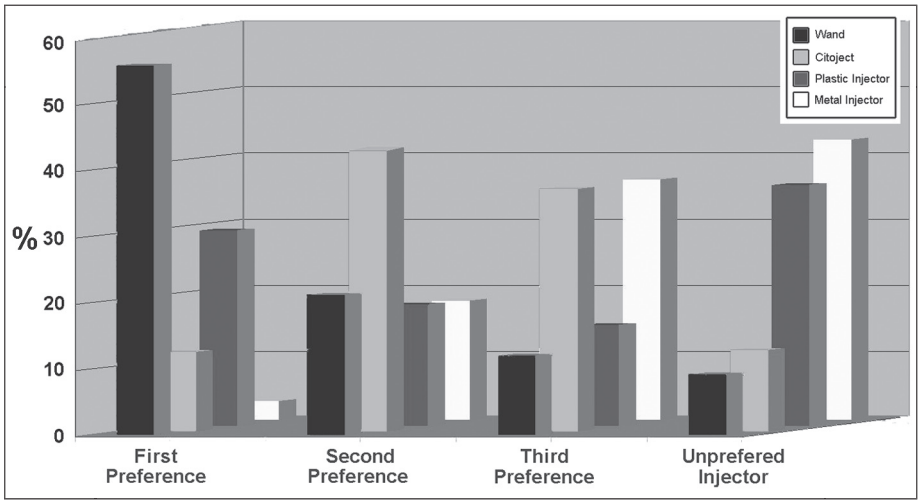

Figure 2. Preference ratings for the injectors displayed to the children.

To interpret these results better, the children were divided into 2 groups—anxious and nonanxious—according to the anxiety tests they had taken. Three tests were used to determine the multidimensional aspect of anxiety, and the mean anxiety scores of the group were used to distinguish between the anxious and nonanxious children. The mean anxiety CDSS-DS score for the study group was 33.9, which indicates a "borderline/mild anxiety" (cutoff point ≥32).[20] For VPT and FIS, no cutoff points were mentioned in the literature. Nearly 34% of the study group exhibited anxiety, which is higher than the scores reported by Tuutti (6%; Finland, 1986), Wogelius (6%; Denmark, 2003), and Alvesalo et al (21%; Finland, 1993)[21] and is consistent with Seydaoğlu et al (34%)[22], but lower than Ulukapı et al (77%).[23]

Nonanxious children chose the PI as the least- and the Wand as the second least-threatening injector, whereas anxious children chose the Wand as the least-threatening injector but did not even touch the PI (Table 3).

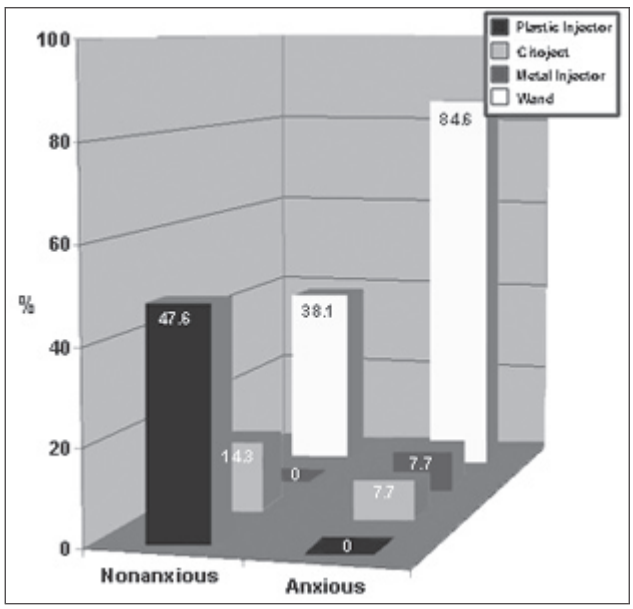

Figure 3. The relationship between first preferred injector and children's anxiety (P=0.011).

There seemed to be some confusion about the PI, with the anxious children calling it a "monster" and trying to disregard it, while the nonanxious children chose it as the least-threatening injector. Therefore, it was decided to investigate this apparent confusion by considering the previous experience of local anesthesia among the anxious and nonanxious groups.

The subjects were divided into of 4 groups according to their local anesthesia experience and their anxiety levels (Table 4): (1) anxious and without local anesthesia experience; (2) anxious and with local anesthesia experience; (3) nonanxious and without local anesthesia experience; and (4) nonanxious and with local anesthesia experience. Among the children who had experienced local anesthesia, the PI was the least threatening for the nonanxious ones but was totally disregarded by the anxious children. The Wand was the second least threatening for the nonanxious children and the least threatening for the anxious children, with a higher preference rate of 83%. Among the children who had had no experience of local anesthesia, the Wand was the least threatening injector both for nonanxious and anxious children. The PI was the second least threatening injector for nonanxious children, but the anxious children totally disregarded it.

Among the nonpreferred injectors, the MI and PI were disregarded with the highest percentage rates and were determined by the authors to be the most threatening injectors.

In Turkey, plastic injectors have a widespread use both in dentistry and medicine. For most dentists, the plastic injector is the most preferred injector for local anesthesia due to its low price. The MI is the second most used. Results indicate that these 2 are the most threatening injectors in use in Turkey and that the children who experienced local anesthesia have a tendency to associate them with painful experiences. Nonanxious patients who had a pain-free experience of anesthesia preferred the PI, indicating that there was no threatening character in their previous experience of the PI. Anxious patients, however, whose negative experience was linked to the use of the PI preferred a nonthreatening injector. For children with no previous experience of dental anesthesia, the choice of injector related to their general experience of medical care and to assumptions and expectations about the injectors presumably based on their physical appearance. The consistent choice of the Wand and Citojet (not used in general medicine) by nonprejudiced children would suggest the child-friendly physical appearance of the injectors per se.

In pediatric dentistry, many pain studies have been carried out with the intention of establishing the:

1. best method (self report, physical, or behavioral) to measure the amount of pain perceived by children; and
2. most painless technique/device for local anesthesia.[1,2,5-8,10,11,20]

The procedure in these studies never included the assessment of the preliminary anxiety levels of the children. In some of these studies, the Frankl behavior classification was used, but this classification solely groups the children according to their cooperative behavior without determining the anxiety level.

CONCLUSIONS

In this present study, it was discovered that:

1. anxiety greatly influences the preference of injectors by children;
2. the determination of children's preliminary anxiety levels helped greatly in understanding the reason for their selection; and
3. the physical appearance of injectors is important to children—especially anxious children.

Table 3. The Relationship Between First Preferred Injector and Anxiety

	Nonanxious children		Anxious children		Total	
First preferred injector	**n**	**%**	**n**	**%**	**n**	**%**
Wand	8	38	11	84	19	56
Plastic injector	10	48	0	0	10	29
Metal injector	0	0	1	8	1	3
Citoject	3	14	1	8	4	12
Total	21	100	13	100	34	100

***Pearson chi-square: df=3; P=.011.**

Table 4. The Relationship Between Experience of Local Anesthesia, First Preferred Injector and Anxiety

		Nonanxious children		Anxious children		Total	
Local anesthesia experience	**First preferred injector**	**n**	**%**	**n**	**%**	**n**	**%**
No*	Wand	4	57	6	86	10	71
	Plastic injector	2	29	0	0	2	14
	Metal injector	0	0	0	0	0	0
	Citoject	1	14	1	14	2	14
	Total	7	100	7	100	14	100
Yes†	Wand	4	29	5	83	9	45
	Plastic injector	8	57	0	0	8	40
	Plastic injector	8	57	0	0	8	40
	Metal injector	0	0	1	17	1	5
	Citoject	2	14	0	0	2	10
	Total	14	100	6	100	20	100
	Grand total	21		13		34	

***Pearson chi-square: df=2; P=.301.**
†Pearson chi-square: df=3; P=.024.

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