Effect of an Active Distraction Method for Pediatric Venipuncture Related Pain and Anxiety

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Abstract

Needle-associated fear and pain in children can lead to poor health consequences and lower uptake rates of medical services. Information and distraction are significant methods in reducing pain and anxiety in children. We aimed to evaluate the effects of giving information and an active distraction method for pediatric venipuncture-related pain and anxiety in 3-8 years old children. Children were randomized into three groups as the control, the informed, the informed and distracted. Fear and pain experience were found to be significantly lower in the informed and distracted group rather than the control and the informed group according to the parents/caregivers. Fear and pain experience were similarly found to be significantly lower in the informed and distracted group than the other groups according to the independent observer. Informing, preparing, coping, distracting methods should be used before, during, and after the invasive procedures to reduce children's pain and anxiety.

Introduction

Painful procedures such as drawing blood, vaccination, injection, which are part of medical services, are stressful for children and their families. Although topical and systemic analgesic agents are readily applicable and used commonly, such invasive procedures remain among the most feared procedures by children (1–3)

Some children and young people consider the process very painful and disquieting. Therefore, needle-associated pain and fear may lead to health-threatening implications such as hiding pain, living with pain, undergoing a lower number of injections and hence benefiting less from the treatment (1).

Recently, new methods that will decrease fear and anxiety associated with invasive procedures have constantly increased. These methods include; informing the family and the child, training the personnel performing an invasive procedure, using various coping techniques, arranging the environment and positioning the child to feel him/herself safe, and incorporating play experts into the process (4). These methods aim to minimize the pain and anxiety of the children undergoing invasive intervention, to help them in developing coping mechanisms for their long term physical and psychological health, to enhance the competence of health personnel carrying out invasive procedures causing pain and anxiety, and to recognize when other supplementary factors can be activated (1, 4, 5)

Distraction is a simple and effective technique that can distract children from stressful interventions and is presented to decrease the effect of pain and behavioral disturbances. There are two basic distraction methods. i.e. active and passive. In the active distraction method, children are encouraged to engage in another activity, however in the passive distraction technique, children usually remain silent during the procedure. Hence, passive distraction techniques are involved with watching a stimulant rather than the active participation of children. There are many studies about the effects of different distraction techniques coping with pain, anxiety, and distress during pediatric procedures (6–8).

Informing the family and child properly before invasive procedures like drawing blood etc. is important for their comprehension of the procedure and establishing a trustful relationship between the individuals (1, 4, 7, 8).

In our study, it was aimed to evaluate the effects of giving information and an active distraction method for pediatric venipuncture-related pain and anxiety in 3–8 years of children.

Material And Methods

Study design

The current study was carried out in a room of the General Pediatrics Outpatient Clinic of Hacettepe University, İhsan Doğramacı Children's Hospital reserved for this study by a single nurse, an independent observer, child development and education specialist, and general pediatrician. It was designed as a randomized prospective study.

Ethical considerations

Approval was obtained from the ethics committee of our hospital for the study (GO 18/1185). The aim and method of the study were explained to the children and their parents/caregivers, and they were informed that in case they did not want to continue, they could withdraw from the study without stating any reasons.

Setting and Samples

All children between the ages of 3–8 without any neurodevelopmental disorder were included in the study. They were randomized into three groups. Namely: 1) the group in which no information was given and no distraction methods were used during drawing blood, whose blood was taken by the current method (control group), 2) the group in which the child and the family were informed before the procedure by a definite physician (informed group), 3) the group, in which children were guided to play games in a tablet by a definite child development specialist during the procedure after being informed about the procedure with their parents (informed and distracted group). After calculations were performed with descriptive statistics, it was determined that a sample size including at least 42 children was required to find a significant difference between three groups at a 95% confidence interval and 85% statistical power. (Sample size was calculated using G Power 3.1.9.2 version program).

A specified form was filled by the mother/father/caregiver of the patient as well as by an independent observer for each patient in the study. The parents/caregivers were requested to fill the parts of the form including the questions on age, gender, accompanying people, education levels of the parents, whether there was a previous presentation of a hospital or invasive procedure. Additionally, they were asked to evaluate the fear and the pain of the child before and during the procedure. An independent observer enriched the form with the number of interventions during the blood drawing procedure, the duration of successfully completed procedure, the evaluation of the fear of children before the procedure, and pain of

the children during the procedure. Children Fear Scale (CFS) was used to evaluate the children's level of anxiety before blood drawing. CFS is a 0 to 4 scale, showing five cartoon faces that range from a neutral expression (0: no anxiety) to a frightened face (4: severe anxiety) (9). The level of pain resulting from the procedure in each child was assessed by the parent and observer reports, using the Wong-Baker FACES (WB-FACES) pain rating scale. The WB-FACES scale is a 0 to 6 scale, showing six cartoon faces that range from a neutral expression (0: no hurt) to a crying face (6: hurts as much as you can imagine) (10).

Parents were informed with a written text advising them to tell the necessity of the procedure honestly, the possibility of a little pain during the procedure. They were also told not to use statements such as "You will not feel pain", "No need to be anxious", "Blood will not be drawn" or "Do not cry", "No gift to you if you cry", "I will leave you if you cry" and "Keep quiet! Nurse/physician will make an injection", "Do not worry, I will beat and punish them". The physician offered verbal information to the children about the procedure by explaining that the procedure is necessary, pain is inevitable but if he/she cooperates, the procedure will be shorter and less painful.

The procedure of drawing venous blood was carried out by a specified and experienced pediatric nurse. During the procedure, families were allowed to stay with their children, hold their hands, and also keep them in their laps.

Data analysis:

Collected data were recorded in SPSS version 23.0.

Descriptive statistics were calculated by using obtained data (mean, standard deviation, median, percentage). The normality distribution of the quantitative data was evaluated with a histogram and Kolmogorov Smirnov test. One-way variance (ANOVA) was used for the normally distributed values and the Kruskal Wallis variance analysis was used for the non-normally distributed values. The relation between categorical variables and groups was examined with Chi-square analysis. In all tests, a p-value of less than 0.05 was considered significant.

Results

142 patients were included in the study (46 control, 48 informed, and 48 informed and distracted). 74 (52%) patients were girls, while 68 (48%) were boys. The mean age of the patients was 5.4 ± 1.48 . In Table 1, information about the person attending the child to the hospital, whether the child had experienced any previous invasive procedure, the number of occurrences, and whether the procedure was successful at the first attempt is summarized.

Table 1
Summary of some information obtained using the forms within the groups.

	Informed and distracted n (%)	Informed n (%)	Control n (%)
The person attending the child to the hospital			
Both parents	23 (16.1%)	25 (17.6%)	22 (15.4%)
Mother	16 (11.2)	15 (10%)	19 (13.3%)
Father	2 (1.4%)	2 (1.4)	3 (2.1%)
Mother and caregiver	6 (4.2%)	6 (4.2%)	2 (1.4%)
A caregiver other than parents	1 (0.7%)	0	0
The number of previous invasive procedures			
0	3 (2.1%)	3 (2.1%)	6 (4.2%)
1–5	24 (16.9%)	23 (16.1%)	12 (8.4%)
6–10	13 (9.1%)	18 (12.6%)	14 (9.8%)
> 11	8 (5.6%)	4 (2.8%)	14 (9.8%)
How long ago was the previous procedure carried out?			
< 10 days	6 (4.2%)	10 (7%)	3 (2.1%)
11–20 days	2 (1.4%)	5 (3.5%)	1 (0.7%)
21–30 days	11 (7.7%)	3 (2.1%)	7 (7.7%)
31 days-3 months	6 (4.2%)	12 (8.4%)	8 (5.6%)
4–6 months	3 (2.1%)	3 (2.1%)	9 (6.3%)
7–12 months	10 (7%)	8 (5.6%)	8 (5.6%)
> 1 year	8 (5.6%)	3 (2.1%)	4 (2.8%)
Procedure at first attempt			
Successful	46 (32.3%)	46 (32.3%)	44 (30.9%)
Not successful	2 (1.4%)	2 (1.4%)	2 (1.4%)

The expediency of giving information before the procedure was asked to the families in two groups (informed group, informed and distracted group). Giving information was significantly found to be more beneficial in the informed and distracted group rather than the only informed group. ($p = 0.000$). In the informed and distracted group, of 48 parents of the patient, 20 (41.7%) considered information absolutely

beneficial, 23 (51.1%) very beneficial, 5 (10.4%) not or a little beneficial, while in the informed group, of 48 parents of the patient, 22 (48.9%) considered information very beneficial, 26(54.2%) not or a little beneficial, nobody considered it absolutely beneficial.

In the informed and distracted group, of 48 parents of the patient, 40 (83.3%) considered distraction absolutely beneficial, 5 (3.5%) very beneficial, 1 (2.1%) a little beneficial, while 2 (4.2%) considered it useless. It was learned that 74 (52.1%) patients who had blood drawing experience before worried during the procedure. Nineteen (13.4%) of the parents of these children experienced fear and anxiety during the previous procedure, while 111 (78.2%) did not have such feelings. It was also learned that passive distraction methods were applied to the sixteen of the patients with previous experience 16 (12.3%).

The median, 25, and 75 quartile values of pain and fear for each group are illustrated in Table 2 according to the parents/caregivers and independent observer. Fear and pain experience were found to be significantly lower in the informed and distracted group rather than the control and the informed group ($p = 0.001$ for pain, $p = 0.005$ for fear). Fear and pain experience were similarly found to be significantly lower in the informed and distracted group than the other groups according to the independent observer. ($p = 0.002$ for pain, $p = 0.000$ for fear).

Table 2

The median, 25, and 75 quartile values of each group according to the parents/caregivers and the independent observer

	Informed and Distracted Median (25–75 quartile)	Informed Median (25–75 quartile)	Control Median (25–75 quartile)	Test Statics	p-value
Pain according to relative of patient	1 (0–2) ^a	2 (1–2) ^b	2 (1–2) ^a	14.008	0.001
Fear according to relative of patient	1 (0–1) ^a	1 (1–1) ^b	1 (1–1) ^b	10.730	0.005
Pain according to independent observer	1 (0-3.5) ^a	1 (0–5) ^{a,b}	4 (1–5) ^b	12.087	0.002
Fear according to independent observer	0 (0–1) ^a	1 (0–4) ^b	3.5 (0–4) ^b	18.779	0.0000

Comparison of fear and pain levels between groups according to the parents/caregivers and independent observer is illustrated in Table 3.

Table 3
Comparison of fear and pain levels between groups according to the parents/caregivers and independent observer

	Groups compared	P
Pain according to the parents/caregivers	Informed&distracted-Informed	0.025
	Informed&distracted -Control	0.001
	Informed-Control	0.948
Fear according to the parents/caregivers	Informed&distracted-Informed	0.024
	Informed&distracted -Control	0.009
	Informed-Control	1
Pain according to the independent observer	Informed&distracted-Informed	0.350
	Informed&distracted -Control	0.002
	Informed-Control	0.164
Fear according to the independent observer	Informed&distracted-Informed	0.016
	Informed&distracted -Control	0.000
	Informed-Control	0.389

When the assessment of the children's fear was compared by the independent observer and the parents/caregiver, no significant difference was found between the informed and distracted group ($p = 0.154$), however, a significant difference was found between the control and informed groups. ($p = 0.000$, $p = 0.000$). When the assessment of the children's pain was compared by the independent observer and the parents/caregiver of pain by the independent observer and parents/caregivers, a significant difference was found in all three groups (informed and distracted group $p = 0.004$, informed $p = 0.000$, control $p = 0.000$) Fear and pain evaluations by the independent observer and parents/caregivers are shown in Figs. 1 and 2.

The anxiety of the parents was significantly found to be lower in the informed and distracted group according to the independent observer ($p = 0.007$).

A significant difference was found when the duration of the procedure in three groups was evaluated by an independent observer ($p = 0.01$). The median, 25, and 75 quartile values of the procedure duration in each group are illustrated in Table 4.

Comparison of the procedure duration between the groups is illustrated in Table 5.

Table 4
The median, 25, and 75 quartile values of the procedure duration in each group.

	Informed and distracted Median (25–75 quartile)	Informed Median (25–75 quartile)	Control Median (25–75 quartile)	p- value
Duration of procedure (min)	1.5 (1–3)	1 (1–2)	2 (1–3)	0.001

Table 5
Comparison of the procedure duration between the groups according to the independent observer.

	Groups	p-value
Duration of the procedure between the groups	Informed&distracted-Informed	0.027
	Informed-Control	0.023
	Informed&distracted-Control	1

Discussion

Painful medical procedures such as phlebotomy and injection may lead children to feel fear and anxiety. American Society for Pain Management Nursing emphasized that coping strategies for pain and anxiety before and during painful procedures in children are important for pain and anxiety control in their adulthood. Therefore, they recommend pharmacological and nonpharmacological approaches for controlling pain (11). Various methods are used to decrease the perception of pain during medical procedures recently and distraction is one of the most commonly used non-pharmacological methods. Distraction methods are used in various forms to divert the attention of the patient from the painful stimulus. (12–16). In our study, a method of letting the patients to play games on a tablet was selected as an active distraction method in one of the groups. Preparing children for upcoming painful procedures is also considered as another intervention method in the recent reports. Strong and consistent evidence indicates that proper preparation before any invasive procedure is very beneficial for children (1) In our study, parents/caregivers in two groups were informed with a form so that they can prepare the children accordingly before the procedure, and children were informed verbally by a special physician as well.

A significant difference was found between the three groups in terms of fear and pain levels of patients; where it was found to be lower in the distracted and informed group than in the other groups according to the evaluations performed by parents/caregivers and an independent observer.

For pediatric acute pain management, many distraction methods such as watching cartoons, blowing balloons, playing with an interactive robot, looking into virtual reality gadgets, reading books, listening to music, and interacting with clowns were evaluated by investigators. In a meta-analysis of 19 pediatric

pain management studies evaluating distraction efficiency revealed that distraction has a reasonable effect in decreasing distress behavior. In these studies, distraction was found to be very effective especially in children younger than seven years (8).

Watching cartoons as a passive distraction was found to be more effective than playing with a robot as an active distraction in the study of Maclaren et al (6). In the study of Mason et al (17), reading books to the child by their parents was considered an active distraction, while watching cartoons was considered passive, and stress levels were found to be significantly lower in the reading book group. These miscellaneous results may be associated with the selection of different distraction methods, measurement methods, and design of the studies. However, it was reported in many studies that active or passive distraction reduced fear and pain before and during the procedure (6, 13, 14, 18, 19, 20). In our study, active distraction was used in only one group. No distraction methods were used in the other two groups. In this study, giving information was found significantly more beneficial in the informed and distracted group than the only informed group according to the parents. In the study of Wang et al (5); therapeutic touch, encouragement, and guided imagery methods were utilized during the procedure in the intervention groups, and the pain was found significantly lower in this group than the control group. However; in our study, no significant difference was found in the comparison of the informed and control groups in terms of pain and fear. It was also underlined in the literature that an experienced staff should give information by spending adequate time (12, 17). In the current study, information was given by a physician just before blood was drawn, which may be one of the limitations of this study. Bijttebier et al. (14) reported that children with negative medical experiences displayed higher levels of anxiety before an invasive procedure, also they were more distressed and less cooperative during the procedure. Negative medical experiences in childhood lead to reports of pain and fear in adulthood medical events and result in refraining from medical services (20). Giving information over a longer time by a dedicated staff can be more effective. Since the majority of patients had blood drawing experience previously, that can be considered another limitation in this study (n:130, 92%). In this context, even just giving accurate information may be effective in reducing pain and fear.

Parents' anxieties of the informed and distracted group were found significantly lower by an independent observer ($p = 0.007$) in this study. In the study of McCarthy et al (15), the parents of a group were trained on distraction coaching to distract their children and compared to the control group, and it was attained that the children and their parents in the trained group had less stress, which was statistically significant compared to the control group.

McCarthy et al (15) stated that if parents believe in nonpharmacological interventions and are encouraged to use their skills, they may be less stressed during the implementation of invasive procedures on their children and prepare their children better for the procedure. In our study, the stress level was lower in the informed and distracted group, which may be explained by the fact that children were prepared better for the procedure by health care personnel.

In the current study, a significant difference was found between the duration of the procedure in three groups. In a study by Wang et al (5), it was found to be longer in the control group.

In this study, pain and fear scores of children were found lower by both parent and independent observer in the informed and distracted group. Also, parental anxiety was found lower by the independent observer in this group. Some studies have demonstrated that parental anxiety affects the anxiety of the child during invasive procedures. Training parents for coping and distracting was found effective in decreasing the stress levels of children before and during the procedure (8, 11, 19). In our study, parents in informed and distracted group were convinced that distracting and informing has a positive effect on their children in experiencing less anxiety. Jurdi et al. (20) and Wohlheiter et al. (18) stated that electronic video games are very useful in coping with anxiety, stress, and pain; however, they also recommended that more studies should be carried out to confirm benefits and positive outputs. Incompatible with the Jurdi et al. (20) we observed that playing tablet games in pediatric hospital settings seems to increase emotional expressions; and reduce pain, anxiety, and stress. However, there are not many evaluations available on these issues, and more should be carried out to confirm these benefits.

In conclusion, informing, preparing, coping, distracting methods should be used before, during, and after the invasive procedures to reduce children's pain and anxiety. Interventions on this issue should be holistic and psychological support should be provided to children who cannot manage their stress additionally health care professionals should be trained to help the children in mitigating their stress and anxiety.

Declarations

Ethics approval and consent to participate

Ethical aproval was obtained from the ethics committee of Hacettepe University Medical School with the number GO 18/1185.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

EI acting as the corresponding author has finalized the concept and design, worked as the coordinator person in acquisition and interpretation of data. She also drafted the article regarding the important intellectual content.

MY helped in taking the samples and assisted in acquisition of data.

EP assisted in applying the distraction method, so she helped in the acquisition of data.

EO revised the manuscript and gave consent to the final version to be uploaded.

OT revised the manuscript and gave consent to the final version to be uploaded.

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Figures

Figure 1

Comparison of pain levels according to the parents and independent observer of each group.

Figure 2

Comparison of fear levels according to the parents and independent observer of each group.