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Original Article

The Effect of Watching Cartoon and Moving Musical Toy on Children's Pain and Fear Levels During Invasive Procedures

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ABSTRACT

Objective: This study aims to determine the effect of watching cartoon and moving musical toy on children's pain and fear levels during invasive procedures.

Methods: The research is a randomized controlled experimental study. The study sample consisted of 120 children—40 in the cartoon group, 40 in the moving musical toy group, and 40 in the control group—who volunteered to participate. "Questionnaire form," "Wong–Baker Faces Pain Rating Scale (WB-FPRS)," and "Children's Fear Scale (CFS)" were used. The research used cartoon and moving musical toy as intervention tools.

Results: The difference between the 3 groups' WB-FPRS and CFS mean scores was statistically significant after the procedure. The difference between preapplication and postapplication WB-FPRS and CFS mean scores of the 3 groups was statistically significant ($P < .05$).

Conclusion: It was concluded in the study that watching cartoon and moving musical toy are effective in reducing the pain and fear levels of children. It can be recommended to inform nurses working in pediatric services about simple and affordable techniques that have been proven effective, such as showing cartoons and using musical toys, to reduce pain and fear during procedures. It is essential to encourage nurses to implement these methods in their practice.

Keywords: Watching cartoon, children, fear, invasive procedure, moving musical toy, pain

Introduction

Emergency services are intricate settings that are often riddled with uncertainties. This uncertainty creates fear and anxiety for children and parents. Peripheral vascular access is a necessary aspect of treatment for hospitalized children; however, the process can be traumatic and uncomfortable.[1]

In response to pain, children aged 3-6 years cry, scream, point to the site, and show aggressive behaviors and active physical resistance to pain. Children are afraid of interventions to their bodies with some tools and losing the integrity of their bodies.[2, 3] Children have listed their greatest fears about hospitals as being away from their homes and loved ones, staying in the hospital for a long time, going to the hospital, being away from their toys, a foreign environment they do not know about, being among people in white uniforms running with unfamiliar tools and equipment, various procedures enforced, not knowing what will happen to them, getting physically hurt, and getting injected.[4] Fear and pain management should be developed using a language suitable for the age and mental development of the child, and the cooperation of parents and families should be taken to the center of care.[5]

It is essential to manage this process with a team of healthcare professionals who evaluate the child holistically to minimize the effects of fear and pain caused by invasive procedures. In this team, a great responsibility falls on nurses with the most contact with the patient and their family. Nurses use many methods to reduce pain and fear that may occur during interventions. Of these methods, non-pharmacological methods are the easiest to access, have the least risk on children, and are both more cost-effective and time-saving. Using these methods, nurses can define

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children's pain and fear and better evaluate nursing care with practical planning and application.[6-8]

Pain in children generally causes fear and anxiety. Distraction methods used in pain treatment strengthen the pain threshold of the child in the 3-6 age group by focusing attention in another direction, making the pain less perceived, and reducing anxiety.[3,4] Studies have shown that distracting children effectively reduces pain and fear. Some methods used for this distracting: watching cartoons, using a kaleidoscope, using soap bubbles, blowing balloons, playing video games, listening to music, using virtual reality glasses, using distraction cards, using hospital clowns, and distracting with parents' support.[9-12] In studies on watching cartoons in the 3-6 age group, it has been found that children reduce pain and fear.[13-16] It is reported that using toys as a distraction for the 3-6 age group effectively affects the pain and fear levels of children.[17-19]

Today, children often watch cartoons on television, computers, and tablets. Cartoons can be used to engage the child during care practices.[20] Toys are essential for children aged 3-6.[21,22] The sound and visual features of cartoons and musical-moving toys can attract the child's attention and prevent the child from feeling pain and fear during the invasive procedure. In the literature, cartoon studies are watched in invasive procedures for pain and fear in children aged 3-6, but toy studies are limited. This study aims to determine the effect of watching cartoon and moving musical toy on children's pain and fear levels during invasive procedures.

Research Hypotheses

H1a: Watching cartoon during invasive procedures reduces pain.
H1b: Watching cartoon during invasive procedures reduces fear.
H1c: Using a moving musical toy during an invasive procedure reduces pain.
H1d: Using a moving musical toy during an invasive procedure reduces fear.

Methods

Design and Sample

The study was conducted as a randomized controlled experiment (NCT05303454- ClinicalTrials.gov registration). The study was conducted at the Pediatric Emergency Service located east of Turkey between June and December 2021. There is 1 intervention room in the Pediatric Emergency Service. This room includes a blood-collection table and materials for vascular access-collecting blood (branule, cotton, 70% alcohol, tourniquet, plaster, injector, blood tubes, etc.). Three nurses work during the day shift, while 3 nurses work during the night shift, and there are a total of 12 nurses working in the service.

The study population consisted of 3- to 6-year-old children admitted to the Pediatric Emergency Service in the east of Turkey between June and December 2021 for treatment. The study sample consisted of 120 children—40 in the cartoon group, 40 in the moving musical toy group, and 40 in the control group—who were admitted to the pediatric emergency service within the specified dates and volunteered to participate in the study.

Sample Size and Randomization

Power analysis was conducted with G*Power to determine a sufficient sample size for detecting significant differences. The power analysis showed that a sample size of 124 would be enough to detect significant differences, with a 99% power at a 0.05 significance level and a large effect size of 0.55. Four children withdrew from the study, 2 from each group. The final sample included 120 children. Figure 1 depicts the sampling flow diagram. Before randomization, children were compared by "age, gender, and fear of interference" and randomly assigned to 3 groups. The randomization method was implemented using a computer program on "www.random.org."

Inclusion criteria include "being between the ages of 3 and 6 years, being admitted to the hospital for an acute reason, children whose mother or father accompanies them during the procedure."

Exclusion criteria include "having chronic diseases; having a febrile disease at the time of admission; visual, audio, or speech impairments; mental disorders; history of sedative, analgesic, or narcotic substance use within 24 hours before admission."

Data Collection Tools

"Questionnaire form," "Wong–Baker Faces Pain Rating Scale (WB-FPRS)," and "Children's Fear Scale (CFS)" were utilized. Cartoon and moving musical toy were used as intervention tools in the study.

Questionnaire Form

This form prepared by the researchers by examining the literature [8,10,11] includes "6 questions about descriptive characteristics of the child (age, gender, previous hospitalization experience, vascular access in the last six months, reactions to hospital when ill, reactions to previous vascular access procedures)."

Wong–Baker Faces Pain Rating Scale

The scale was developed in 1981 by Wong and Baker and revised in 1983. This pain scale helps children ages 3-18 describe their pain level. It features 6 facial expressions corresponding to different pain intensity levels, ranging from 0 (no pain) to 5 (extreme pain), arranged from right to left. On the left, the facial expression shows a smile, indicating no pain; on the right, the facial expression shows a cry, indicating intense pain. Children are often asked to pick the facial expression that best represents their emotional state. Six facial expressions are scored between 0 and 5. 0 means no pain, and 5 illustrates the most severe pain.[23]

Children's Fear Scale

McMurty et al[25] (2011) developed the scale to assess fear in children undergoing painful medical procedures. Gerçeker et al[26] conducted a validity and reliability study on this scale in Turkey in 2018. Children's Fear Scale is a scale scored from 0 to 4 using 5 faces to display levels of fear, ranging from neutral expression (0) to extreme fear (4). During emotional intelligence exercises, children are often asked to select the facial expression that best represents their current emotional state. As children's scores on the scale increase, their fear levels also increase.

Intervention Tools

Cartoons

Two different cartoons were used in this study, and these were among the ones most liked by children: "Kırmızı balık" (redfish) and "Niloya." Kırmızı balık and Niloya are cartoons of animation. Before the procedure, children were asked which of the 2 cartoons they wanted to watch. They attract children's attention effectively since they appeal to the visual and auditory senses. Cartoons were shown to children with the tablet purchased with the funds the project received (Figures 2 and 3).

Moving Musical Toy

The toy, which was approved by 3 faculty members who are experts in the field of child development and pediatric nursing, is supported by the Ministry of Health, and it was purchased with the funds the project received. It is a toy suitable for the developmental characteristics

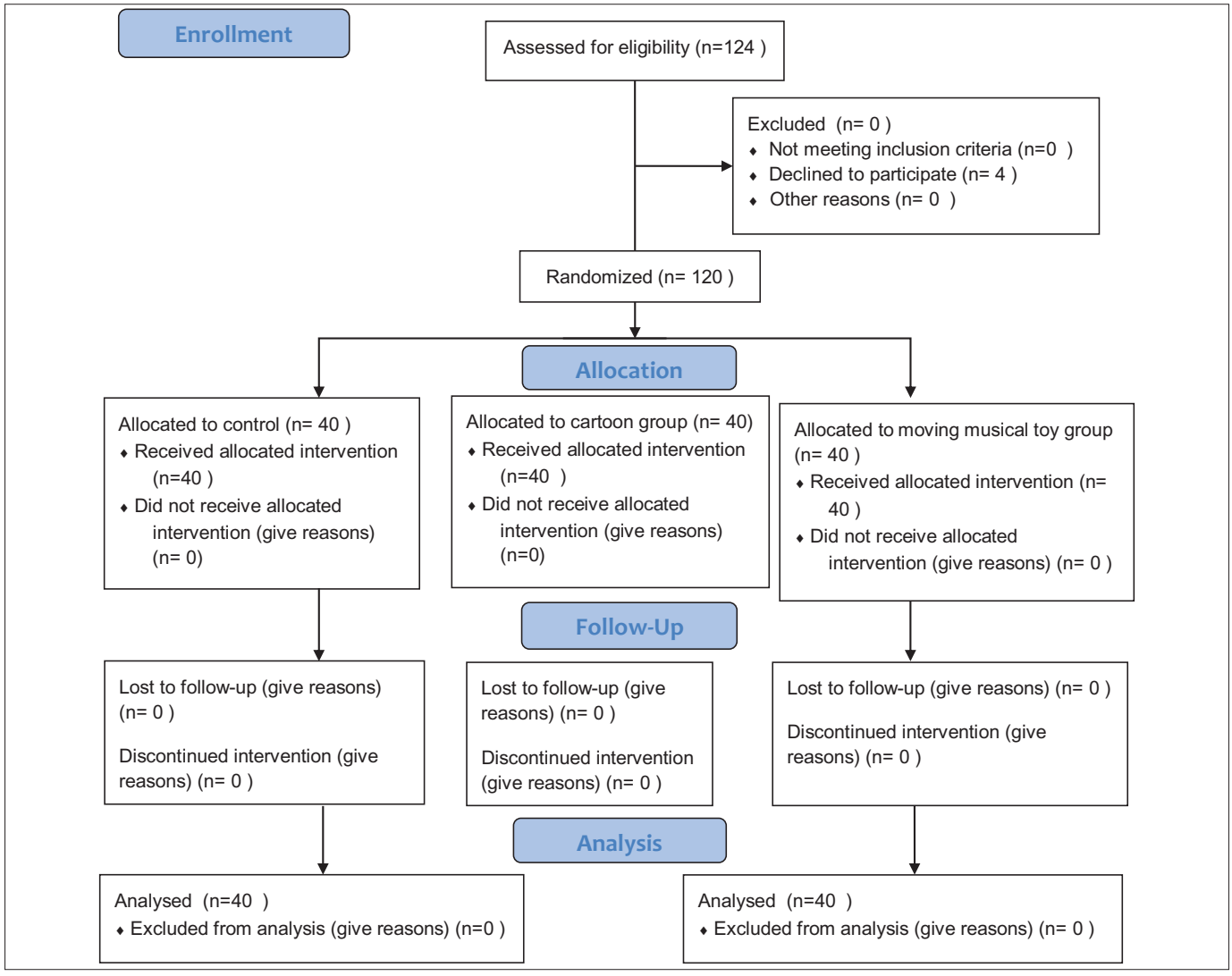

Figure 1. Flow of study.

of children 3 years of age and older. The toy looks like the cartoon character Pepee; it has flashing lights on its arms, moves right and left, and has a moving belly. It dances to the music and attracts children's attention with the flashing colorful lights on its arms and moving right and left (Figure 4).

Data Collection

Before collecting the data, the researcher spent 1 day in the pediatric emergency service to examine the ergonomic structure of the treatment and intervention room. After the children and their parents were provided with preliminary information about the study, verbal consent was obtained from children, and written consent was obtained from their parents. The data of the study were collected using a face-to-face interview technique with children who agreed to participate in the study.

Pilot Study

The pilot study was carried out with 6 children admitted to the Pediatric Emergency Service of the hospital and who underwent vascular access

Figure 2. Red fish.

Figure 3. Niloya.

Figure 4. Pepee toy.

in June 2021. The children in the pilot study were not involved in the research group. The pilot study determined the time to apply cartoon and moving musical toy.

Procedure

A vascular access procedure at the doctor's request was performed with the same nurse who had a working experience of 7 years. The condition of having vascular access with 1 intervention was provided in the study. Children who did not have vascular access with 1 intervention were excluded from the study. A vascular access procedure was carried out according to the routine practice of the clinic.

Routine Vascular Access Procedure

Vascular access procedure was performed in all children in the pediatric emergency department by 1 nurse with pediatric emergency department experience using a 24-gauge IV catheter. The vascular access procedure took an average of 3 minutes (range: 1-5 minutes). Parents stayed with their children before, during, and after the procedure.

Control Group

The researcher completed the form and scales 5 minutes before the vascular access procedure. The control group received only routine practices. Five minutes after the procedure, the scales were filled in again. It took about 5-10 minutes to fill out the forms.

Cartoon Group

The researcher completed the form and scales 5 minutes before the vascular access procedure. The children in the cartoon group were asked which cartoon they wanted to watch before the procedure and were allowed to choose. The children in the cartoon group watched cartoon starting from 3 minutes before the invasive procedure until the procedure ended. The vascular access procedure was performed according to routine practice after a parent and the personnel set the procedure area while the child was lying supine on the blood collection table. Meanwhile, the child watched a cartoon via the tablet on the moving table in front of the blood collection table. Five minutes after the procedure, the scales were filled in again. It took about 5-10 minutes to fill out the forms.

Moving Musical Toy Group

The researcher completed the form and scaled 5 minutes before the vascular access procedure. Pepee was introduced by the researcher 3 minutes before the procedure, and the child was allowed to play. Before the procedure, it was played on the table in front of the blood collection table on which the procedure was performed, and the toy was activated. The procedure was carried out after the child concentrated on the toy. During the procedure, the moving musical toy was placed in the child's field of vision so that the child could see the toy, not the procedure. The vascular access procedure was performed according to routine practice after a parent and the personnel set the procedure area while the child was lying supine on the blood collection table. Five minutes after the procedure, the scales were filled in again. It took about 5-10 minutes to fill in the forms.

Data Analysis

The data were collected by the researcher and analyzed by a statistician after ensuring blinding was preserved during coding. The data were analyzed with The Statistical Package for Social Sciences version 22.0 software (IBM Corp.; Armonk, NY, USA). The normality distribution of the data was stated with kurtosis and skewness coefficients. In addition to numbers, percentages, means, and SDs are used in data analysis. The χ^2 test was used to compare categorical variables, and variance analysis was used to compare constant variables such as age. Variance analysis was used to compare the children's pain and fear mean scores between groups. Within group comparisons, an independent group *t*-test was used for normally distributed data, and Mann–Whitney *U* analysis was used for non-normally distributed data. The least significant difference (LSD) was used as an advanced analysis when the variances were homogenous.

Ethical Considerations

Ethical approval (March 4, 2021 dated and B.30.2.ATA.0.01.00/36 numbered) and official permission from the related institution were taken to conduct the study. The research group explained the study's purpose to eligible children and their parents, answered questions, and obtained verbal consent from children and written consent from parents. Ethical principles were followed in the study. After the data were collected, the control group of children watched cartoons and played with moving musical toy to fulfill the "Principle of Equality."

Results

It was found that the average age of the children in the cartoon group was 4.20 ± 0.91, 52.5% were female, 80% did not have previous hospitalization experience, 70% had experienced a vascular access procedure within the past 6 months, 60% reacted by crying on coming to the hospital when they were sick, and 67.5% responded by crying to previous vascular access procedures (Table 1).

It was found that the average age of the children in the moving musical toy group was 4.03 ± 0.89, 62.5% were female, 72.5% did not have previous hospitalization experience, 65% had experienced a vascular access procedure within the past 6 months, 67.5% reacted by crying on coming to the hospital when they were sick, and 77.5% responded by crying to previous vascular access procedures (Table 1).

It was found that the average age of the children in the control group was 4.55 ± 0.99, 60% were male, 57.5% did not have previous hospitalization experience, 77.5% had experienced a vascular access procedure within the past 6 months, 45% reacted by crying on coming to the hospital when they were sick, and 55% responded by crying to previous vascular access procedures. It was also found that the children in the cartoon, moving musical toy, and control groups were similar in descriptive characteristics (Table 1, $P > .05$). As can be seen in Table 2, the difference between B-FPRS and CFS mean scores of the 3 groups was not statistically significant before the application ($P > .05$).

Table 1. Comparison of Groups According to Descriptive Characteristics of Children

	Cartoon Group		Moving Musical Toy Group		Control Group		
Descriptive Characteristics	**n**	**%**	**n**	**%**	**n**	**%**	**Significance**
Gender							
Male	19	47.5	15	37.5	24	60.0	$\chi^2 = 4.071$ $P = .131$
Female	21	52.5	25	62.5	16	40.0	
Previous hospitalization experience							
Yes	8	20.0	11	27.5	17	42.5	$\chi^2 = 5.000$ $P = .082$
No	32	80.0	29	72.5	23	57.5	
Vascular access procedure experience in the last 6 months							
Yes	28	70.0	26	65.0	31	77.5	$\chi^2 = 1.533$ $P = .465$
No	12	30.0	14	35.0	9	22.5	
The child's reaction to the hospital							
Cry	24	60.0	27	67.5	18	45.0	$\chi^2 = 10.095$ $P = .258$
Don't get angry	7	17.5	10	25.0	11	27.5	
Beware	9	22.5	3	7.5	11	27.5	
Child's reaction to vascular access							
Cry	27	67.5	31	77.5	22	55.0	$\chi^2 = 13.328$ $P = .206$
Don't get angry	4	10.0	5	12.5	7	17.5	
Beware	9	22.5	4	10.0	11	27.5	
Constant Variables	**n**	**Mean ± SD**	**n**	**Mean ± SD**	**n**	**Mean ± SD**	
Children's age	40	4.20 ± 0.91	40	4.03 ± 0.89	40	4.55 ± 0.99	$F = 3.302$ $P = .051$

Table 2. Comparison of Preapplication Wong–Baker Faces Pain Rating Scale and Children's Fear Scale Mean Scores

	Cartoon Group (n = 40)		Moving Musical Toy Group (n = 40)		Control Group (n = 40)		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Significance**
WB-FPRS	3.63	1.17	3.65	0.80	3.50	1.48	$F = 0.184$ $P = .832$
CFS	3.08	1.12	3.03	0.77	2.83	1.34	$F = 0.579$ $P = .562$

CFS, Children's Fear Scale; WB-FPRS, Wong–Baker Faces Pain Rating Scale.

As can be seen in Table 3, the difference between the WB-FPRS and CFS mean scores of the 3 groups was statistically significant after the application ($P < .05$). In the advanced analysis conducted to find out which group the difference resulted from (LSD), it was found that the 3 groups differed in terms of mean WB-FPRS scores. The control group's mean WB-FPRS score was higher than the mean WB-FPRS scores of the cartoon and moving musical toy groups. In addition, the cartoon group's mean WB-FPRS score was also higher than that of the toy group. In the advanced analysis conducted to find out which group the difference resulted from (LSD), it was found that in terms of CFS scores, the mean scores of the moving musical group were lower than those of the cartoon and control group.

As can be seen in Table 4, the difference between preapplication and postapplication WB-FPRS and CFS mean scores of the 3 groups was statistically significant ($P < .05$). The mean WB-FPRS and CFS scores decreased significantly after the procedure.

Table 3. Comparison of Postapplication Wong–Baker Faces Pain Rating Scale and Children's Fear Scale Mean Scores

	Cartoon Group (n = 40)		Moving Musical Toy Group (n = 40)		Control Group (n = 40)		
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Significance**
WB-FPRS	1.80	1.26	1.15	1.03	2.73	1.71	$F = 13.481$ $P = .000$
CFS	1.60	1.24	0.90	0.84	2.25	1.41	$F = 12.953$ $P = .000$

CFS, Children's Fear Scale; WB-FPRS, Wong–Baker Faces Pain Rating Scale.

Discussion

After the invasive procedure, the control group of children experienced the highest levels of pain and fear, followed by the cartoon group and the moving musical toy group, respectively. It was found that watching cartoon effectively decreases children's pain and fear of invasive

Table 4. Comparison of Preapplication and Postapplication Wong–Baker Faces Pain Rating Scale and Children's Fear Scale Mean Scores

	Preapplication		Postapplication		
	Mean	**SD**	**Mean**	**SD**	**Significance**
Cartoon group					
WB-FPRS	3.63	1.17	1.80	1.26	$t = 11.152$ $P = .000$
CFS	3.08	1.12	1.60	1.24	$t = 10.303$ $P = .000$
Moving musical toy group					
WB-FPRS	3.65	0.80	1.15	1.03	$Z = -5.596$ $P = .000$
CFS	3.03	0.77	0.90	0.84	$t = 18.594$ $P = .000$
Control group					
WB-FPRS	3.50	1.48	2.73	1.71	$t = 6.684$ $P = .000$
CFS	2.83	1.34	2.25	1.41	$t = 4.309$ $P = .000$

CFS, Children's Fear Scale; WB-FPRS, Wong–Baker Faces Pain Rating Scale.

procedures. These results support the H1a and H1b hypotheses of the study.

In a study conducted by Devi and Shinde[13] on preschool children who received vascular access procedures, it was found that watching cartoons effectively reduced pain during vascular access procedures. In a study conducted by Downey and Zun[14] on children aged 3-5 and 6-18 during painful procedures in the emergency service, it was found that watching cartoons effectively reduced pain perception in young children. In a study by Durak and Uysal,[15] watching cartoons was found to be a more effective method in reducing fear when compared with using game cards. In a study they conducted with 3- to 7-year-old children, Kuo et al[16] found that cartoons effectively reduced children's pain and fear levels during vascular access procedures. In a study on 3- to 6 year-old children during a vascular access procedure, Lobo and Umarani[20] found that children who watched cartoons felt less pain than those in the control group. It was found in a study by Miguez-Navarro et al[27] conducted with 3- to 11-year-old children who received vascular access procedures in the emergency service that the pain scores of the group that watched the video were lower.[27] Bergomi et al[28] found that cartoon effectively reduces children's fear and anxiety during vascular access. In other studies conducted in the literature, distracting methods applied to children were found to reduce children's fear.[29-32] The present study's conclusions are the same as those of research in the literature, showing that cartoons effectively distract patients during invasive procedures.

Moving musical toy effectively reduced children's pain and fear of invasive procedures. These results support the H1c and H1d hypotheses of the study. It is reported that using toys to distract children is effective on children's pain and fear levels.[17,18] Turgut's[19] study found that light-operated toys given to 3- to 6-year-old children during blood collection procedures reduced their pain and fear levels. In their study on 4-6 children who underwent vascular access procedures in the emergency service, Karaca and Çevik[33] found no significant difference between fear scores of the moving musical toy group and the control group regarding fear scores before, during, and after the procedure. However, although no statistically significant difference was found, it was reported that children in the study group had fewer fear scores than those in the control group after the procedure. It was found in Atak's[34] study that toys with auditory and tactile stimuli, which are distracting strategies, reduced pain during the procedure. A study by Silva et al[35] reported that therapeutic toy use during the blood collection process in preschool children would be suitable for children in invasive, painful, and fearful procedures. The conclusions of the present study are the same as the results found in the literature and show that moving musical toys are effective in distracting during invasive procedures.

In the control group, the difference between the mean pain and fear scores before and after the procedure was found to be significant. The fact that the level of pain and fear children reported in invasive procedures related to injection was higher than the level of pain and fear they said to have perceived during the procedure can be explained by the fear of the unknown, their strong fantasies related to fearful procedures, and their intense anxiety, which are the developmental characteristics of that age group. Similarly, in a study conducted by Erdoğan and Özdemir[36] on 6- to 12-year-old children, the effects of distraction methods such as virtual reality glasses, distraction cards, and the Buzzy method on managing pain, anxiety, and fear were examined. According to the self-reports of children in the control group, a statistically significant difference was found between the mean pain scores.

Limitations

A potential limitation of the study is that the researcher who collects the data cannot be blinded. In addition, environmental and familial variables may have impacted the child's answer. The family's attitude can affect the child's fear and pain levels.

Implications for Practice

It can be recommended to inform nurses working in pediatric services about simple and affordable techniques that have been proven effective, such as showing cartoons and using musical toys, to reduce pain and fear during procedures. It is essential to encourage nurses to implement these methods in their practice. It can be recommended to conduct further evidence-based studies in which the efficiency of non-pharmacological methods is tested in different painful procedures, and in children of different age groups.

Conclusion

After the invasive procedure, the control group of children experienced the highest levels of pain and fear, followed by the cartoon group and moving musical toy group, respectively. According to the study, cartoons and moving musical toys effectively reduce pain and fear levels in children.

Ethics Committee Approval: Ethical committee approval was received from Atatürk University Faculty of Medical Clinical Research Ethics Committee (Approval no: B.30.2.ATA.0.01.00/36, Date: March 4, 2021).

Informed Consent: Written and verbal informed consent was obtained from the participants who agreed to take part in the study.

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Declaration of Interests: The authors declare that they have no competing interest.

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