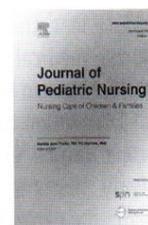




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The effect of vibrating cold application and puppet use on pain and fear during phlebotomy in children: A randomized controlled study

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ABSTRACT

Background: Non-pharmacological methods are often used as a creative strategy to reduce pain and fear in children during a painful procedure such as phlebotomy.

Objectives: This study was conducted to evaluate the effects of Bee Buzzy and puppet use on pain and fear during phlebotomy in children.

Methods: This randomized controlled study was conducted in the pediatric phlebotomy unit of a university hospital. The CONSORT checklist was used in this study. The sample of 3–6 years children ($n = 105$) was divided into groups by block randomization. Children's pain and fear scores were evaluated with the Wong-Baker Faces Pain Rating Scale and Children's Fear Scale by the parents and the nurse who attempted phlebotomy during phlebotomy.

Results: A statistically significant difference was found between the Bee Buzzy and puppet and Bee Buzzy and control groups in pain scores ($p < .05$). Pain scores were lower in the Bee Buzzy group than in the puppet and control groups. A statistical difference was found between Bee Buzzy and the control group or puppet and control group according to all fear scores ($p < .05$). Fear scores were lower in the Bee Buzzy and puppet group ($p < .05$).

Conclusions: The results show that the use of Bee Buzzy during phlebotomy has a pain-relieving effect, and the use of Bee Buzzy and puppet has an anti-fear effect in 3–6-year-old children.

Implications for practices: The use of Bee-Buzzy and puppets is effective in reducing pain and fear in children as they increase effective communication and distract attention.

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Introduction

Pain is one of the negative experiences experienced in pediatric patients due to various medical interventions and often causes fear and anxiety (Binay Yaz & Bal Yilmaz, 2021). Pain perception is affected by the child's age, development and cognitive level, communication skills, previous pain experiences, and pain beliefs. Severe and long-term pain resulting from interventions can cause behavioral and physiological problems. In this period, if the pain is not alleviated or eliminated with appropriate interventions, it may cause neurological and behavioral disorders in the future (Akcan & Polat, 2017; Akcan & Yiğit, 2016; Binay Yaz & Bal Yilmaz, 2021). Chronic pain can lead to psychiatric

disorders, hyperactivity disorders, and social, educational, and professional inadequacies (Brown et al., 2017). Nurses are responsible for minimizing the pain felt by children exposed to painful interventions and helping them cope with it (Akcan & Yiğit, 2016). Various pharmacological and non-pharmacological methods are used to relieve pain. Phlebotomy and vascular access are the most common invasive procedures applied to children. Distraction methods are one of the non-pharmacological methods with the highest level of evidence used to reduce the pain associated with invasive procedures in children. The use of non-pharmacological methods in pain management is an integral part of the care given to children experiencing pain. Thanks to these practices, children's attention is diverted from painful and frightening procedures (Turgut & Türkmen, 2023; Ugucu et al., 2022; Wang et al., 2022; Yıldırım & Gerçeker, 2023). It is important to use non-pharmacological methods alone or in combination with pharmacological methods according to the needs of children in pediatric pain management (Gerçeker et al., 2018). In addition to pediatric pain management, distraction methods are used as an effective method to

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reduce fear, and anxiety and increase comfort during preparation for or during medical procedures (Binay Yaz & Bal Yilmaz, 2021; Wang et al., 2022; Yıldırım & Gerçekler, 2023).

Distraction can be done actively (using interactive toys, cards, electronic games, Virtual Reality/VR, balloons, and ball squeezing) or passively (listening to a story or piece of music, watching TV, and watching cartoons) (Aydin et al., 2016; Kuo et al., 2018; Sadeghi et al., 2013). With the distraction method, the attention of children can be shifted to the stimuli that are substituted for the stimuli they perceive as dangerous (Koller & Goldman, 2012). Studies have shown that distraction can effectively reduce pain (Abu-Elenen et al., 2018; Aydin et al., 2016; Balliel, 2022; Binay et al., 2019; Binay Yaz & Bal Yilmaz, 2022; Gerçekler et al., 2018; Turgut & Türkmen, 2023; Ugucu et al., 2022; Uman et al., 2013). To achieve success, the distraction technique should be chosen according to age (Ugucu et al., 2022; Wang et al., 2022). Visual and auditory stimulation given to children may be more effective than abstract or sedentary stimulation (Kuo et al., 2018; Turgut & Türkmen, 2023). In this context, playing with a puppet can provide a safe environment that leads to emotional relaxation and tension reduction (Borhani et al., 2012). While playing with a puppet, children can discharge their mental energies, and develop and reshape their physical and mental energies (Oluç & Sarılioğlu, 2023). External vibratory cold application is also a commonly used non-pharmacological distraction method to reduce pain and fear. In the literature, there are studies with cold application and vibrating devices in bee appearance (Ballard, 2019; Ballard et al., 2019; Binay et al., 2019; Gerçekler et al., 2018; Özdemir, 2019). However, no study was found comparing it with a puppet.

This study aimed to evaluate the effects of the use of Bee Buzzy, external vibrating cold application, and the use of puppets on pain and fear in children aged 3 to 6 years during phlebotomy.

Methods

Research design

This research was a randomized controlled trial and the CONSORT checklist was used by guidelines.

Population and sample of the research

The population of the study consisted of children aged 3–6 years who came to the pediatric phlebotomy department of a university hospital on the specified dates.

The sample of the study consisted of 105 children (35 experimental I group, 35 experimental group II group, 35 control group) who came to the phlebotomy department between February 15 and March 17, 2023, whose child and parents agreed to participate in the study, and who had successful phlebotomy in the first attempt. The exclusion criteria were having a chronic disease, mental disability or mental retardation, taking analgesics in the last 24 h, being hospitalized, having undergone a surgical procedure, not having a successful phlebotomy on the first attempt, and the child and his/her family not being willing to participate in the study.

Ethics committee approval

This study was approved by the Non-Interventional Clinical Research Ethics Committee of a state university (Date: July 2022; Decision No:661) and the hospital institution's permission was obtained. Oral and written informed consent was obtained from the parents.

Sample size

In the power analysis before the study, the pain score variable was used based on the study conducted by Sahiner and Bal (2016)

(Sahiner & Bal, 2016). Gpower 3.1.0 statistical program showed that 41 patients in each group were needed based on an effect size of 0.15, at a power of 0.85. An acceptable type I error size of 0.05 (Schulz, Altman, Moher, and the Consort Group, 2010).

Randomization

A total of 147 children were enrolled for eligibility in this study. As a result of the evaluation, a total of 24 children ($n = 16$) who did not accept to participate in the study and who had a chronic disease ($n = 8$) were excluded from the study. A total of 123 children who met the study criteria were randomized. To determine which group the children who agreed to participate in the study and met the sample selection criteria would be included in, the numbers from 1 to 123 were randomly distributed to 3 groups without number repetition through a (<https://www.random.org/>) computer program. A total of 123 pediatric patients, 41 in Group 1 (Bee Buzzy), 41 in Group 2 (Puppet), and 41 in Group 3 (Control) were recruited. After randomization, a total of 18 children were excluded from the study due to unsuccessful phlebotomy at the first attempt ($n = 17$) and missing data ($n = 1$). The final sample of the study consisted of 105 children who met the inclusion criteria, as shown in Fig. 1. Randomization was followed by two other researchers (researcher 2 and researcher 3) who took part in the data collection phase. Confidentiality of allocation was maintained for study participants. Assignment to intervention and control groups was made in consultation with an independent statistician. Blinding technique was used to prevent bias and ensure confidentiality. Selection bias was controlled by performing random assignments and concealing randomization. The child and parent did not know which group they would be in; they only knew the application in the group to which they were assigned.

Data collection tools

Patient introductory information form

There were questions about the child's age, gender, the number of phlebotomy attempts performed in the last year, the time since the last phlebotomy, the age of the accompanying parent, the number of children, education level, and the parent's fear of needles (Aydin et al., 2016; Binay Yaz & Bal Yilmaz, 2021; Gerçekler et al., 2018).

Facial expression rating scale (Wong-Baker Faces Pain Rating Scale)

The Facial Expression Rating Scale includes 6 facial expressions and is a scale that provides a rating between 0 and 10 (Conlon, 2009; Huguet et al., 2010). Facial expressions range from "0" a smiling "brutal" face, 1–2 "It hurts a little", 3–4 "It hurts a little more", 5–6 "It hurts even more", 7–8 "It hurts a lot", and 9–10 "It hurts worst". This scale does not require words or numerical values and is a reliable and valid measurement tool in the assessment of acute pain. With this scale, the child's pain was evaluated and recorded by both the nurse who performed the phlebotomy and the parent.

Children's fear scale

Faces Anxiety Scale McKinley et al. (2003) "The Faces Anxiety Scale" for adult patients (McKinley et al., 2003). The same scale was adapted for pediatric patients as the "Children's Fear Scale" by McMurtry et al. (2011). This scale includes 5 different facial expressions. This scale is scored between 0 and 4 and it is stated to be a reliable and valid measurement tool in the evaluation of fear (McMurtry et al., 2011). The permission to use the scale was obtained by Binay and Bal Yilmaz (2019), and Turkish validity and reliability studies were conducted (Binay & Bal Yilmaz, 2019; Binay Yaz & Bal Yilmaz, 2022).

Data Collection

The data were obtained from 105 children aged 3–6 years and their parents between February and March 2023. The children and their parents were informed about this study by the researchers. Verbal consent

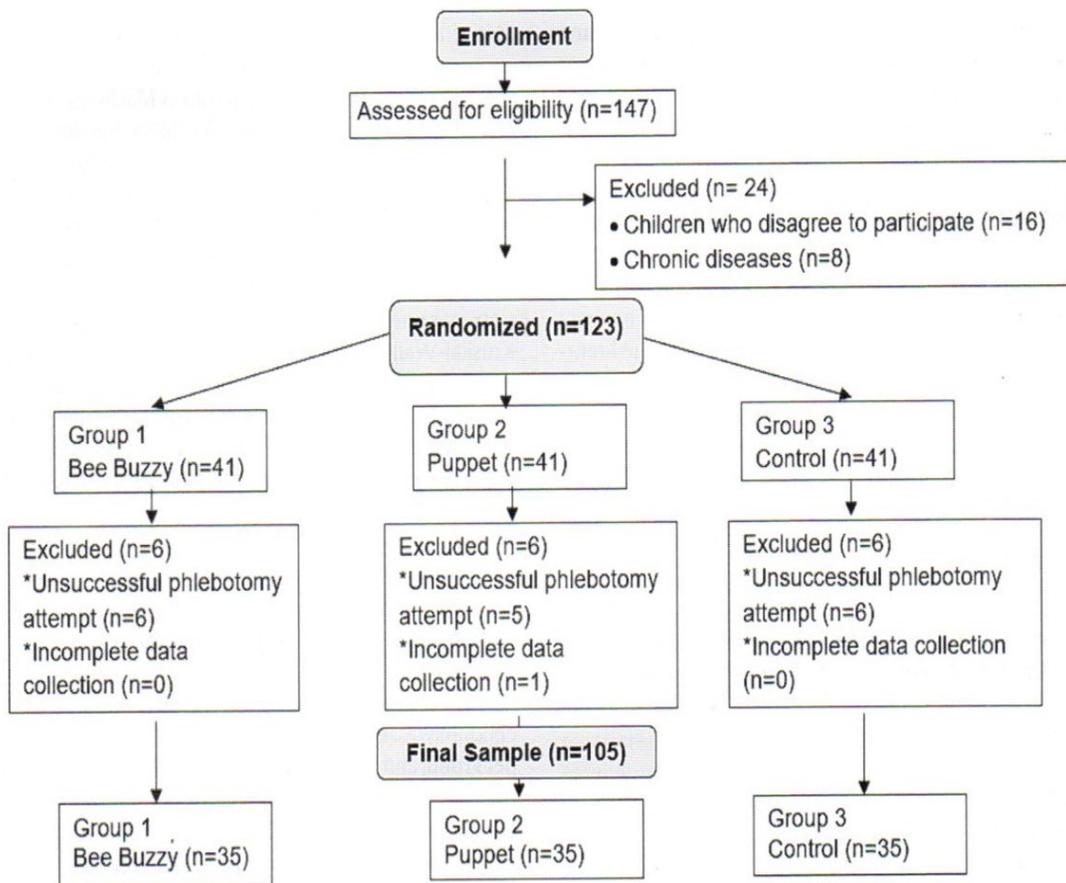


Fig. 1. CONSORT flow diagram.

was obtained from the children who volunteered to participate in the study. Verbal and written consent was obtained from their parents. Participants were not given information about the groups. Randomization was provided by researchers 2 and 3, and the child was included in one of the study groups. Phlebotomy was performed on all children by a single nurse. It was ensured that the same nurse applied to prevent the difference in practice.

Pre-intervention

Data were collected with the “Patient Introductory Information Form”. Children in the three groups, their parents, and the nurse were informed about the “Wong-Baker Faces Rating Scale”, and the ‘Children’s Fear Scale’. All parents were asked to wait with their children during the procedure.

Intervention

The nurse performed the blood draw. According to this study, whichever group the child was in, that method was used during phlebotomy. The nurse who collected blood and the parents measured the children’s pain and fear during the intervention with the Wong-Baker Faces Pain Rating Scale and Children’s Fear Scale.

Study groups

Group 1: Bee Buzzy group. Bee Buzzy was attached to the arm of the 3–6-year-old child included in this group by the researcher, where the phlebotomy will be performed on the child. Bee Buzzy reduces pain thanks to its cold wings and vibration. It helps to distract attention during phlebotomy and reduces the feeling of pain and fear. Bee Buzzy was tied 5 cm above the area from which blood would be drawn, and after waiting for 15 s, the nurse performed a phlebotomy (Fig. 2).

Group 2: puppet group. While the nurse was going to perform the phlebotomy operation on the 3–6-year-old child included in this group, one



Fig. 2. The Bee Buzzy.

of the researchers (researcher 3) tried to distract the child by putting the puppet on her hand and making her talk. The principal investigator received training in play therapy. The speech text of the puppet was prepared by the principal investigator, and other researchers were given play therapy training. The puppet used was chosen by the researchers for children and the name of the puppet was determined. The puppet was named 'Puppet Zuzu' (Fig. 3). The puppet was evaluated by the researcher who received play therapy training. The puppet is in the form of an animal and its facial expression is in the form of a smiling face. The colors of the puppet are determined in such a way that they do not create fear in children. There are studies in the literature in which such puppets are used (Krögera & Nupponen, 2019).

Group 3: control group. No attempt was made to the 3–6 year old child included in this group, during the process when the nurse performed the phlebotomy. Routine phlebotomy was performed on the 3–6 year old child.

Post-intervention

Researchers 2 and 3 asked about the perception of nurses and parents about pain and fear of children after phlebotomy and helped them record it on the observation sheet.



Fig. 3. The Puppet Zuzu.

Statistical analysis

In the study, International Business Machines (IBM), Statistical Package for the Social Sciences Statistics (SPSS) Version 26.0 was used. In descriptive statistics, data on variables were given as mean, standard deviation, number, and percentage. The chi-square test and ANOVA were used to compare descriptive features between groups. The fit of the parameters to the normal distribution was evaluated with the Kolmogorov-Smirnov test. Since the data did not show normal distribution, parameter comparisons between groups were made with the Kruskal-Wallis test. Post-hoc analysis was performed in a pairwise comparison of the groups. Mann Whitney *U* test with Bonferroni correction was used to determine the source of difference between groups. The significance level in the study was accepted as $p < .05$. The researcher who made the analysis was blinded to which group the children were in. The groups were numbered 1, 2, and 3 during the analysis.

Results

Characteristics of the children and parents

Characteristics of children are given in Table 1. The mean age of the children was 4.96 ± 1.08 in the Bee Buzzy group, 4.46 ± 0.91 in the Puppet group, and 4.57 ± 1.11 in the control group. The number of phlebotomy last year was 1.63 ± 1.16 in the Bee Buzzy group, 2.11 ± 1.54 in the Puppet group, and 1.71 ± 0.98 in the control group. Most of the children were male (Bee Buzzy group = 51.4%; Puppet group = 62.9%; Control group = 51.4%). Most of the children were with their mothers during the intervention (Bee Buzzy group = 70.0%; Puppet group = 94.3%; Control group = 71.4%).

Characteristics of parents are given in Table 2. The mean age of the parents was 34.71 ± 4.99 in the Bee Buzzy group, 33.17 ± 6.23 in the Puppet group, and 36.20 ± 9.77 in the control group. Most of the parents were high school graduates (Bee Buzzy group = 48.6%; Puppet group = 42.9%; Control group = 54.3%). Most parents had two (2) children (Bee Buzzy group = 71.4%; Puppet group = 37.1%; Control group = 51.4%). Most parents had no fear of phlebotomy (Bee Buzzy group = 85.7%; Puppet group = 62.9%; Control group = 85.7%).

The groups were homogeneous according to the children's gender, age, Number of phlebotomies in the last year, time since the last phlebotomy (month), and the parent next to a child during phlebotomy. They were homogeneous according to the age of the parent, number of children, education level, and phlebotomy fear of the parent ($p > .05$) (Table 1 and Table 2).

Comparison of pain and fear based on parent's report

Pain and fear scores based on parent's reports according to groups were presented in Table 3. The mean pain score was 3.03 ± 1.79 in the Bee Buzzy group, 5.26 ± 1.78 in the Puppet group, and 5.57 ± 1.88 in the control group. Statistical difference was found between groups according to parent-reported pain scores ($p < .001$). Pain scores were determined at a lower level in the Bee Buzzy group. The mean fear score was 1.77 ± 1.08 in the Bee Buzzy group, 2.06 ± 0.83 in the Puppet group, and 3.14 ± 0.81 in the control group. Statistical difference was found between groups according to parent-reported fear scores ($p < .001$). Fear scores were determined at a lower level in the Bee Buzzy and Puppet groups (Table 3).

Comparison of pain and fear based on nurse's report

Pain and fear scores based on nurse's reports according to groups were presented in Table 4. The mean pain score was 2.43 ± 1.57 in the Bee Buzzy group, 5.26 ± 1.65 in the Puppet group, and 5.51 ± 1.83 in the control group. Statistical difference was found between groups according to nurse-reported pain scores ($p < .001$). Pain scores

Table 1
Characteristics of children.

Variables	Bee Buzzy Group (n = 35)		Puppet Group (n = 35)		Control Group (n = 35)		t	p
	X ± SD		X ± SD		X ± SD			
Age (year)	4.96 ± 1.08		4.46 ± 0.91		4.57 ± 1.11		4.167*	0.125
Number of phlebotomy	1.63 ± 1.16		2.11 ± 1.54		1.71 ± 0.98		2.660*	0.265
Time since the last phlebotomy (month)	5.57 ± 5.93		3.97 ± 2.14		4.86 ± 6.20		0.262*	0.877
	n	%	n	%	n	%		
Gender								
Girl	17	48.6	13	37.1	17	48.6	1.233**	0.540
Boy	18	51.4	22	62.9	18	51.4		
The parent next to the child during the phlebotomy								
Mother	28	70.0	33	94.3	25	71.4	6.297**	0.354
Father	7	30.0	2	5.7	10	28.6		

X: Mean, SD: Standard Deviation, *: Kruskal Wallis Test, **: Chi-square test.

were determined at a lower level in the Bee Buzzy group. The mean fear score was 1.46 ± 1.01 in the Bee Buzzy group, 1.97 ± 0.82 in the Puppet group, and 3.17 ± 0.78 in the control group. Statistical difference was found between groups according to nurse-reported fear scores (p < .001). Fear scores were determined at a lower level in the Bee Buzzy and Puppet groups (Table 4).

Pairwise comparisons of groups

Statistical difference was found between Bee Buzzy or Puppet group and Control group according to parent, and nurse-reported pain scores (p < .05). Statistical difference was not found between Puppet or Control group according to all pain scores (p > .05) (Table 5).

Statistical difference was not found between Bee Buzzy and Puppet group according to all fear scores (p > .05). Statistical difference was found between Bee Buzzy and Control group or Puppet and Control group according to all fear scores (p < .05) (Table 5).

Discussion

Medical interventions such as phlebotomy and vascular access, which are frequently applied in children, cause pain, fear, and anxiety (Wang et al., 2022). The use of non-pharmacological methods in reducing pain, fear, and anxiety is an important part of care (Gerçeker et al., 2018). One of these methods, the distraction method, is one of the methods with the highest level of evidence (Akcan & Polat, 2017; Akcan & Yiğit, 2016; Binay et al., 2019). In this study, Bee Buzzy and puppet Zuzu, which give external vibrating cold application, were

used in 3 to 6-year-old children during phlebotomy. The effect on children's pain and fear during the procedure was evaluated. As a result of the research, it was found that the use of Bee Buzzy, which gives external vibrating cold application during phlebotomy, was effective in reducing pain, and the children in the Bee Buzzy group experienced less pain intensity. It was determined that the use of puppets during the phlebotomy process was not effective on the severity of pain and that the children in the experimental and control groups experienced similar pain severity. It was observed that children between the ages of 3–6 experienced less fear during phlebotomy with the use of Buzzy Bee and Puppet. Cho et al. (2022), in a quasi-experimental study in Taiwan, the Buzzy was used during intravenous injection in children aged 3–7 years and it was found to be effective in reducing children's pain (Cho et al., 2022). Küçük Alemdar and Yaman Aktaş (2019) found that the use of Bee Buzzy during and after phlebotomy in children aged 5–10 years is effective in reducing pain. In the same study, it was determined that the use of Bee Buzzy during phlebotomy reduced the fear levels of children (Küçük Alemdar & Yaman Aktaş, 2019). Ballard et al. (2019) examined the effectiveness of the Bee Buzzy, which combines cold and vibration for needle-related procedural pain in children, in a systematic review and meta-analysis study, and the Bee Buzzy was seen as an effective intervention for procedural pain management in children (Ballard et al., 2019). Susam et al. (2018), Buzzy and distraction cards were used during intravenous intervention to children aged 3–10, and it was found that the use of Buzzy was effective in reducing children's pain (Susam et al., 2018). In a randomized controlled study conducted by Bergomi et al. (2018), it was determined that the external cold and vibration application (Buzzy) and watching animated cartoons during intravenous intervention reduced the pain of children (Bergomi et al., 2018). In a study evaluating the effectiveness of Buzzy application in children experiencing pain, fear, and anxiety during vaccination, it was found that it had an effect on the pain and anxiety levels of children, and there was a significant difference in the pain and fear scores reported by the nurse (Sapçı et al., 2021). Ueki et al. (2021), in a study examining the effect of applying vibrating Buzzy with ice packs in children younger than 6 years of age who received vaccine injections, no significant difference was found in the researchers' assessment of pain, but Buzzy application was found to be effective in reducing the pain experienced by parents' children (Ueki et al., 2021). This study is similar to the literature in that the use of Bee Buzzy as a distraction method is effective in reducing pain and fear during phlebotomy in preschool children. When the studies in the literature were examined, we saw that the studies involving the use of therapeutic puppets were limited. In the study of Oluç & Sarılioğlu, 2023, it was found that the therapeutic game based on hand puppet reduces the pain associated with phlebotomy in preschool children (Oluç & Sarılioğlu, 2023). In our study, the fact that the use of puppets was not effective on pain severity may have resulted from the previous phlebotomy experiences of the participants.

Table 2
Characteristics of parents.

Variables	Bee Buzzy Group (n = 35)		Puppet Group (n = 35)		Control Group (n = 35)		t	p
	X ± SD		X ± SD		X ± SD			
Age of parent	34.71 ± 4.99		33.17 ± 6.23		36.20 ± 9.77		0.644*	0.725
	n	%	n	%	n	%		
Education level								
Elementary	8	22.8	2	5.8	6	17.1	2.247**	0.139
High school	17	48.6	15	42.9	19	54.3		
University	10	28.6	18	51.3	10	28.6		
Number of children								
1	6	17.1	21	60.0	11	31.4	16.558**	0.573
2	25	71.4	13	37.1	18	51.4		
≥3	4	11.4	1	2.9	6	17.2		
Phlebotomy fear of parent								
Yes	5	14.3	13	37.1	5	14.3	7.126**	0.280
No	30	85.7	22	62.9	30	85.7		

X: Mean, SD: Standard Deviation, *: Kruskal Wallis Test, **: Chi-square test.

Table 3
Comparison of pain and fear based on parent's report.

Group	Pain				Fear			
	X ± SD	Mean rank	Z	p	X ± SD	Mean rank	Z	p
Bee Buzzy	3.03 ± 1.79	30.59	29.696	<0.001	1.77 ± 1.08	39.07	32.032	<0.001
Puppet	5.26 ± 1.78	62.63			2.06 ± 0.83	44.60		
Control	5.57 ± 1.88	65.79			3.14 ± 0.81	75.33		

X: Mean, SD: Standard Deviation, Z: Kruskal Wallis Test.

In our study, it was found that Bee Buzzy or puppet use was effective in pain and fear scores reported by parents and nurses. There was no significant difference between Buzzy the Bee and the puppet group in terms of all fear scores, and both methods were effective in reducing fear. There are not enough studies in the literature on the use of puppets during the phlebotomy procedure. It has been reported that playing finger puppets in children is effective in the pre-operative period, during their entrance to the operating room, and during postoperative fears (Akgün Kostak et al., 2021), pain (Kurt & Seval, 2021; Suzan et al., 2020) and anxiety (Suzan et al., 2020). It has been reported that puppet shows and storytelling methods in preschool children are more effective than storytelling in curing behavioral problems in children (Aminimanesh et al., 2019). The use of puppets to collect data on hospital-related experiences in children diagnosed with chronic diseases is an interesting method for this age group, as it is a tool that helps children express their emotions verbally and non-verbally (Leite et al., 2019). It has been reported that puppets that encourage children with Type 1 diabetes to freely express their feelings and thoughts about their daily experiences, and enable them to exhibit diabetes management behaviors to reveal the factors that may hinder diabetes them from exhibiting diabetes management behaviors, and it has been reported that it enables to reveal the factors that may hinder diabetes management (Sparapani et al., 2013). In a study examining the experiences of pediatric nurses using puppets in the Pediatric Emergency Care Unit, nurses found that the use of puppets increased the interaction between the child and the nurse as it optimized care. In addition, it has been reported that the puppet is effective in educating children, is a source of play and distraction, and is effective in reducing fear and anxiety and comforting the child, as they attract children's attention (Reid-Searl et al., 2017).

The result of this study will contribute to the literature in terms of emphasizing the importance of the use of Bee-Buzzy and puppet, which reduces pain and fear during a painful procedure such as phlebotomy, as a creative strategy in reducing pain and fear in children, as they increase effective communication with the child (Suzan et al., 2020; Wang et al., 2022; Yıldırım & Gerçeker, 2023).

Implications for practices

Invasive interventions cause pain, fear, and anxiety in children. The use of non-pharmacological methods reduces pain, fear, and anxiety. Although there are studies with cold application and vibrating devices in bee appearance in the literature, no study has been found comparing it with puppets (Bergomi et al., 2018; Sapçı et al., 2021; Suzan et al., 2020; Wang et al., 2022; Yıldırım & Gerçeker, 2023).

Table 4
Comparison of pain and fear based on nurse's report.

Group	Pain				Fear			
	X ± SD	Mean rank	Z	p	X ± SD	Mean rank	Z	p
Bee Buzzy	2.43 ± 1.57	25.86	43.047	<0.001	1.46 ± 1.01	33.77	44.134	<0.001
Puppet	5.26 ± 1.65	65.16			1.97 ± 0.82	46.56		
Control	5.51 ± 1.83	67.99			3.17 ± 0.78	78.67		

X: Mean, SD: Standard Deviation, Z: Kruskal Wallis Test.

Table 5
Pairwise comparisons of groups.

	Bee Buzzy ^a -Puppet ^b	Bee Buzzy - Control ^c	Puppet - Control	Post-hoc Test ^d , p
Pain scores	<i>p</i>	<i>p</i>	<i>p</i>	
Parent-reported	< 0.001	< 0.001	0.856	a < b,c
Nurse-reported	< 0.001	< 0.001	0.903	a < b,c
Fear scores	<i>p</i>	<i>p</i>	<i>p</i>	
Parent-reported	0.530	< 0.001	< 0.001	a,b < c
Nurse-reported	0.066	< 0.001	< 0.001	a,b < c

* Mann Whitney U test with Bonferroni correction.

This article highlights the importance of non-pharmacological methods as a creative strategy for the management of pain and fear during a painful procedure such as phlebotomy. The use of Bee-Buzzy in children to reduce pain and fear, and the use of puppets in reducing fear, since it increases effective communication with children and distracts them will contribute to the literature.

Limitations

This study had several limitations. First, pain severity and fear levels were evaluated only by parents and nurses. Another limitation of the study is that the double-blind method could not be used. The researchers were aware of the groups the children were assigned to. Therefore, researchers were not able to assess children's pain and fear scores.

Parents and nurses reported pain and fear scores after the intervention. They may forget children's exact reactions or responses during phlebotomy. It is thought that this situation may have affected the results of the study. Therefore, it is recommended for future studies to evaluate effective methods for reporting children's pain and fear during intervention to avoid bias.

Conclusion

In our study, we evaluated the effects of the use of Bee Buzzy, which gives external vibrating cold application, and the use of puppets, on pain and fear in 3 to 6-year-old children during phlebotomy; It was found that the use of Bee Buzzy was effective in reducing pain, the use of puppets was not effective in the severity of pain, and the use of Bee Buzzy and puppet was effective in reducing the fear experienced by children aged 3 to 6 during phlebotomy. It was found that the use of Buzzy Bee or Puppet was effective in the pain and fear scores reported by the

parents and nurses. Bee Buzzy has been shown as a promising tool in the management of pain and fear in children in procedural procedures, and the use of puppets in fear management. It is recommended to carry out studies in different age groups and in different clinics to increase the clinical quality level of Bee Buzzy and puppets.

Ethics committee approval

This study was approved by Non-Interventional Clinical Research Ethics Committee of İzmir Bakırçay University (Date: 08.07.2022, Decision No: 661) and the hospital institution permission was obtained. Oral and written informed consent was obtained from the parents.

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CRediT authorship contribution statement

Şeyda Binay Yaz: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Writing – original draft, Visualization, Supervision, Validation, Writing – review & editing. **Sinem Başdemir:** Conceptualization, Data curation, Investigation, Resources, Writing – original draft, Visualization, Validation, Writing – review & editing. **Eliz Geçtan:** Data curation, Resources, Writing – original draft.

Declaration of Competing Interest

There is no conflict of interest to declare by the author.

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References

- Abu-Elenen, N. R. M., Abouzeid, M. I. M., Omar, A. A., & Ismail, G. M. (2018). Impact of distraction techniques on pain and fears indicators among hospitalized children undergoing selected invasive procedures. *World Journal of Medical Sciences*, 15(4), 198–204. <https://doi.org/10.5829/idosi.wjms.2018.198.204>.
- Akcan, E., & Polat, S. (2017). Pain in newborns and the Nurse's role in pain management. *Acbadem University Health Sciences Journal*, 2(2), 64–69.
- Akcan, E., & Yiğit, R. (2016). Physicians' and nurses' approach regarding pain management of newborns in a neonatal clinic in Turkey. *ACU Sağlık Bil Derg*, 2016(3), 147–153.
- Akgün Kostak, M., Kutman, G., & Semerci, R. (2021). The effectiveness of finger puppet play in reducing fear of surgery in children undergoing elective surgery: A randomized controlled trial. *Collegian*, 28(4), 415–421. <https://doi.org/10.1016/j.colegn.2020.10.003>.
- Aminimaneh, A., Ghazavi, Z., & Mehrabi, T. (2019). Effectiveness of the puppet show and storytelling methods on children's behavioral problems. *Iranian Journal of Nursing and Midwifery Research*, 24(1), 61–65. <https://doi.org/10.4103/ijnmr.IJNMR.115.15>.
- Aydin, D., Şahiner, N. C., & Çiftçi, E. K. (2016). Comparison of the effectiveness of three different methods in decreasing pain during venipuncture in children: Ball squeezing, balloon inflating and distraction cards. *Journal of Clinical Nursing*, 25(15–16), 2328–2335. <https://doi.org/10.1111/jocn.13321>.
- Ballard, A. (2019). *Efficacité d'un dispositif combinant le froid et la vibration pour la gestion de la douleur d'enfants lors de procédures impliquant des aiguilles dans les services d'urgence*. Doctoral Thesis, Université de Montréal.
- Ballard, A., Khadra, C., Adler, S., Trottier, E. D., & Le May, S. (2019). Efficacy of the buzzy device for pain management during needle-related procedures. *The Clinical Journal of Pain*, 35(6), 532–543.
- Balliel, N. (2022). Effect of soap bubbles technique, coughing and distraction cards on reducing pain and anxiety during phlebotomy in children. *Paediatric and Neonatal Pain*, 5(2), 31–37. <https://doi.org/10.1002/PNE2.12090>.
- Bergomi, P., Scudeller, L., Pintaldi, S., & Dal Molin, A. (2018). Efficacy of non-pharmacological methods of pain Management in Children Undergoing Venipuncture in a pediatric outpatient clinic: A randomized controlled trial of audiovisual distraction and external cold and vibration. *Journal of Pediatric Nursing*, 42, e66–e72. <https://doi.org/10.1016/j.pedn.2018.04.011>.
- Binay, Ş., & Bal Yilmaz, H. (2019). *The investigation of effects of watching animation education film in the pre-operative period on fear and post-operative pain in children*. Ege University Institute of Health Sciences Doctoral Thesis.
- Binay, Ş., Bilsin, E., Gerçeker, G., Kahraman, A., & Bal-Yılmaz, H. (2019). Comparison of the effectiveness of two different methods of decreasing pain during phlebotomy in children: A randomized controlled trial. *Journal of Perianesthesia Nursing*, 34(4), 749–756. <https://doi.org/10.1016/j.jopan.2018.11.010>.
- Binay Yaz, Ş., & Bal Yilmaz, H. (2021). Effects of virtual reality usage in medical procedures for pediatric patients: Literature review. *Gümüşhane University Journal of Health Sciences*, 10(1), 138–143.
- Binay Yaz, Ş., & Bal Yilmaz, H. (2022). The effects of designing an educational animation movie in virtual reality on preoperative fear and postoperative pain in pediatric patients: A randomized controlled trial. *Journal of Perianesthesia Nursing*, 37(3), 357–364. <https://doi.org/10.1016/j.jopan.2021.04.015>.
- Borhani, F., Baghereian, S., & Abasszadeh, A. (2012). The effect of non-pathological non-pain control methods on pain relief from venipuncture in school age children admitted to thalassemia center of Kerman. *Fac Nurs Midwifery Uroumeiah*, 10(6), 741–748.
- Brown, M. L., Rojas, E., & Gouda, S. (2017). A mind-body approach to pediatric pain management. *Children*, 4(6), 50.
- Cho, Y. H., Chiang, Y. C., Chu, T. L., Chang, C. W., Chang, C. C., & Tsai, H. M. (2022). The effectiveness of the buzzy device for pain relief in children during intravenous injection: Quasirandomized study. *JMIR Pediatr Parent*, 5(2), e15757. <https://pediatrics.jmir.org/2022/2/e15757>. <https://doi.org/10.2196/15757>.
- Conlon, P. M. (2009). Assessment of pain in the paediatric patient. *Paediatrics and Child Health*, 19, S85–S87. <https://doi.org/10.1016/j.PAED.2009.05.019>.
- Gerçeker, G., Binay, Ş., Bilsin, E., Kahraman, A., & Yılmaz, H. B. (2018). Effects of virtual reality and external cold and vibration on pain in 7- to 12-year-old children during phlebotomy: A randomized controlled trial. *Journal of Perianesthesia Nursing*, 33(6), 981–989. <https://doi.org/10.1016/j.jopan.2017.12.010>.
- Huguet, A., Stinson, J. N., & McGrath, P. J. (2010). Measurement of self-reported pain intensity in children and adolescents. *Journal of Psychosomatic Research*, 68(4), 329–336. <https://doi.org/10.1016/j.JPSYCHORES.2009.06.003>.
- Koller, D., & Goldman, R. D. (2012). Distraction techniques for children undergoing procedures: A critical review of pediatric research. *Journal of Pediatric Nursing*, 27(6), 652–681. <https://doi.org/10.1016/j.pedn.2011.08.001>.
- Krögera, T., & Nupponen, A. M. (2019). Puppet as a pedagogical tool: A literature review. *leje*, 11(4), 393–401.
- Küçük Alemdar, D., & Yaman Aktaş, Y. (2019). The use of the buzzy, jet Lidokaine, bubble-blowing and aromatherapy for reducing pediatric pain, stress and fear associated with phlebotomy. *Journal of Pediatric Nursing*, 45, e64–e72. <https://doi.org/10.1016/j.PEDN.2019.01.010>.
- Kuo, H. C., Pan, H. H., Creedy, D. K., & Tsao, Y. (2018). Distraction-based interventions for children undergoing venipuncture procedures: A randomized controlled study. *Clinical Nursing Research*, 27(4), 467–482. <https://doi.org/10.1177/1054773816686262>.
- Kurt, A., & Seval, M. (2021). The effect of finger puppets on postoperative pain in children: A randomized controlled trial. *Clinical and Experimental Health Sciences*, 11(1), 113–118. <https://doi.org/10.33808/clinexphealthsci.713672>.
- Leite, A. C. A. B., Alvarenga, W. A., Machado, J. R., Luchetta, L. F., Banca, R. O., Sparapani, V. C., ... Nascimento, L. C. (2019). Children in outpatient follow-up: Perspectives of care identified in interviews with puppet. *Revista Gaúcha de Enfermagem*, 40. <https://doi.org/10.1590/1983-1447.2019.20180103>.
- McKinley, S., Coote, K., & J. S.-P (2003). Development and testing of a faces scale for the assessment of anxiety in critical ill patients. *Journal of Advanced Nursing*, 41(1), 73–79. <https://doi.org/10.1046/j.1365-2648.2003.02508.x>.
- McMurtry, C. M., Noel, M., Chambers, C. T., & McGrath, P. J. (2011). Children's fear during procedural pain: Preliminary investigation of the Children's fear scale. *Health Psychology*, 30(6), 780–788. <https://doi.org/10.1037/A0024817>.
- Oluç, T., & Sarialioğlu, A. (2023). The effect of a hand puppet-based therapeutic play for preschool children on the fear and pain associated with blood collection procedure. *Journal of Pediatric Nursing*, 72, e80–e86. <https://doi.org/10.1016/j.pedn.2023.06.012>.
- Özdemir, A. (2019). *The effect of techniques on during the invasive processes in other children of 6–12 years (venipuncture procedure / intravenous catheter) on anxiety, fear and pain management*. Zonguldak Bülent Ecevit University Institute of Health Sciences Department of Children's Health and Diseases Nursing Master Thesis.
- Reid-Searl, K., Quinney, L., Dwyer, T., Vieth, L., Nancarrow, L., & Walker, B. (2017). Puppets in an acute paediatric unit: Nurse's experiences. *Collegian*, 24(5), 441–447. <https://doi.org/10.1016/j.colegn.2016.09.005>.
- Sadeghi, T., Mohammadi, N., Shamshiri, M., Bagherzadeh, R., & Hossinkhani, N. (2013). Effect of distraction on children's pain during intravenous catheter insertion. *Journal for Specialists in Pediatric Nursing*, 18(2), 109–114. <https://doi.org/10.1111/jspn.12018>.
- Sahiner, N. C., & Bal, M. D. (2016). The effects of three different distraction methods on pain and anxiety in children. *Journal of Child Health Care*, 20(3), 277–285. <https://doi.org/10.1177/1367493515587062>.
- Sapçı, E., Bilsin Kocamaz, E., & Gungormus, Z. (2021). Effects of applying external cold and vibration to children during vaccination on pain, fear and anxiety. *Complementary Therapies in Medicine*, 58(November 2020), Article 102688. <https://doi.org/10.1016/j.ctim.2021.102688>.
- Schulz, K. F., Altman, D. G., Moher, D., & the Consort Group (2010). CONSORT 2010 statement: Updated guidelines for reporting parallel group randomized trials. *Obstetrics and Gynecology*, 115, 1063–1070. <https://doi.org/10.1097/AOG.0b013e3181d9d421>.
- Sparapani, V. D. C., Jacob, E., De Montigny, F., Pfeifer, L. I., Pacciulo Sposito, A. M., de Lima, R. A. G., & Nascimento, L. C. (2013). The use of puppets as a strategy for communicating with children with type 1 diabetes mellitus. *Journal of Nursing Education and Practice*, 4(2), 186–194. <https://doi.org/10.5430/jnep.v4n2p186>.
- Susam, V., Friedel, M., Basile, P., Ferri, P., & Bonetti, L. (2018). Efficacy of the buzzy system for pain relief during venipuncture in children: A randomized controlled trial. *Acta*