Effect of Buzzy and Watching Cartoons on Venipuncture Pain among Children Undergoing Phlebotomy

Sanaa Mahmoud Ahmed [(1)], Asmaa Hamed Tawfique[(2)], Yahia Mohamed Sayed [(3)]
(1) Pediatric Nursing – Faculty of Nursing, Minia University, Cairo - Egypt
(2) Pediatric Nursing – Faculty of Nursing, Minia University, Cairo – Egypt
(3) Pediatric Nursing – Faculty of Nursing, Minia University, Cairo – Egypt
Corresponding author: yehiamsayed@mu.edu.eg

Abstract

Background: Phlebotomy is among the most traumatic and uncomfortable procedures for children and their families in the emergency department. Buzzy and watching cartoons are effective and inexpensive non pharmacological pain management. **Aim**: To evaluate the effect of buzzy and watching cartoon on venipuncture pain among children undergoing phlebotomy. **Research design:** Quasi-experimental research design was used in current study. **Sample**: A purposive sample of 150 school-age children undergoing phlebotomy. **Setting**: Pediatric emergency units at Minia University Hospital for Obstetrics and Pediatrics **Tools: Tool one:** Structured interview form developed by researcher **Tool two:** Wong Faces Pain Rating Scale. **Results:** Mean scores of the Wong-Baker Facial Pain Rating Scale were significantly decreased in the buzzy group and the watching cartoons group than in the control group. **Conclusion:** It was concluded that buzzy and watching cartoons effectively diminish pain intensity at the venipuncture site among school children during Phlebotomy. The buzzy was more effective in reducing pain than watching cartoon. **Recommendation:** Pediatric health care units should integrate buzzy and watching cartoons to manage needle puncture pain in the routine care for children undergoing venipuncture procedures.

Keywords: Buzzy**,** Children**,** Phlebotomy**,** Venipuncture pain**,** Watching Cartoons

Introduction

Pain continues to be the most complex, distressing, and challenging sensory emotional phenomenon in the life of children **(Semerci, et al., 2023).** The International Association for the Study of Pain (IASP) states that pain is an uncomfortable emotional and sensory event related to, or similar to, existing or potential tissue damage**(Raja etal.,2020).** Pain is considered the "fifth vital sign" that needs to be monitored in medical care and is one of the significant events in children's lives (**Sivri, et al., 2022)**.

Pain and fear are more seen in children admitted to the emergency department (ED) due to acute diseases, acute injuries, and chronic diseases. Because children, unlike adults, do not have coping mechanisms, exposure to traumatic events in early childhood can be remembered for a lifetime. Unfortunately, hospitalized children undergo multiple painful procedures performed routinely for diagnosis and treatment in the emergency departments such as heel-stick, phlebotomy, and peripheral IV placement **(Ballard et al., 2019 and Benini et al., 2020)**. The needle must penetrate the dermis, epidermis, and vein walls to get a blood sample. Simple needle insertion is one of the most terrifying and upsetting medical interventions for children in emergency department **(Czechet al., 2021).**

Tissue damage and stimulation of free nerve endings in these tissues result from the mechanical shock caused by crossing these tissues. A brief, localized, and acute primary pain is felt during entry into the tissue. Phlebotomy-related pain also has a detrimental psychological effect on children and causes them to react negatively **(İnangil, et al., 2020).**

As a result, nursing plays a critical role in decreasing the short- and long-term negative consequences on children. Pharmacological and non-pharmacological interventions are used to treat pain. Non-pharmacologic techniques are non-invasive, affordable, and free of side effects, and they are among the independent nursing tasks. **(Alemdar & Aktaş, 2019).**

Non-pharmacological methods used in children are divided into four types, supportive (family-centered care, empathy, games, individualized developmental care), Physical

methods such as touch, positioning, massage, stimulation of the skin and application of heat or cold packs. Cognitive/behavioral methods, on the other hand, assume that pain has perceptual and behavioral dimensions and consists of relaxation and distraction methods **(Sapçi, et al., 2021)**.

Buzzy is a modern medical device that combines external skin cooling with vibration. This device, which includes an ice pack and a vibration motor, enables us to combine cold application, tactile warning, and distraction approaches. Combining external cold application and vibration, the buzzy technique blocks transmission in peripheral nerves by the cold application and reduces pain levels in accordance with the gate control theory. It is assumed that stimulating Aβ mechanoreceptors simultaneously with vibration will block rapid pain gate via presynaptic inhibition in the dorsal horn **(Ballard et al., 2019, Lescop et al., 2021 and Yilmaz, & Canbulat 2022**).

People of all ages are interested in technology, although the literature discusses the negative effects of technology on children's social development**.** It has been shown that audiovisual distractions (such as video games, movies, television shows, tablets, etc.) It is equally effective at reducing self-reported pain, improving patient participation, and raising the success rate of needle-related procedures as normal psychological intervention **(İnangil, et al., 2020)**.

Distraction is one of the non-pharmacological methods commonly used to effectively manage procedural pain as well as reduce fear and anxiety in children. This method aims to distract the child by providing different sensory stimuli (such as auditory, tactile, visual, olfactory and motor) during painful procedures **(Czech, et al., 2021 and Ugucu, et al., 2022).** Visual distraction reduces pain and allows for emergency venous blood collection. Distractions redirect the stressful stimulus and focus the patient on a pleasant stimulus **(Tork, 2017 and Bergomi, et al., 2018**).

Significance

Due to the chaotic environment, loud noises, bright lights, unpredictable waiting times, painful or frightening procedures, and tumultuous environments, pediatric emergency departments are among the most stressful environments for children and their families. As a result, these factors increase children's pain perception **(Litewin et al 2021)** .Pain management is one of the indicators of the quality of care in the emergency department, which can be used as a marker to assess the quality of care. Pediatric pain is still underestimated and inadequate management by a health professional despite presence of guidelines, protocols, and pharmacological interventions **(Benini et al., 2020).**

Although several studies have reported that nurses play an important role in pain management during needle-related procedures, obstacles such as the rapid flow of patients to the pediatric emergency department remain, emergency medical conditions, inadequate staffing, time constraints, and lack of qualified staff to manage pain in children lead to inadequate pediatric pain management in needle stick. Notwithstanding these obstacles, maintaining compliance with pain management is always the greatest priority because it is a matter of human rights. **(Brennan et al., 2019 and Özkan & Polat, 2020).**

Because venipuncture is children's most common undergo in the emergency department, nurses need to use simple, inexpensive, and fast-acting strategies to control pain during the procedure. Therefore, this study aimed to evaluate the effect of buzzy and watching cartoons on venipuncture pain among children undergoing phlebotomy.

Operational definitions:

Buzzy device:

Buzzy is a reusable 3- inch by 2-inch safe medical device that looks like a bumble bee and can provide vibration with ice pack wings to decrease sharp pain in adults and children during venipuncture procedures such as blood drawing, intravenous placement and vaccination. It works with batteries and conducts cold and vibrations to the area .The cold pack stays in a freezer and is mounted on a device before use. The cold application and vibration start just before the procedure and continue until the end of the procedure. The

device is placed 5 to 10 cm above the application area just before blood drawing. All needed information about the device can be found at the Web site https://www. buzzy4shots. com.

Phlebotomy:

Phlebotomy refers to medical procedure in which a needle is used to take blood from a vein for laboratory testing according to doctor order and also called blood draw, blood sampling and venipuncture.

Aim of the Study

The aim of the present study was to evaluate the effect of buzzy and watching cartoons on venipuncture pain among children undergoing phlebotomy

Research hypotheses:

The present study examines the following research hypotheses:

1. Children undergoing phlebotomy who will apply buzzy at the venipuncture site will have lower mean scores of Wong-Baker Faces Pain Rating Scale in group I (buzzy) compared with those in the control group.
2. Children undergoing phlebotomy watching cartoons will have lower mean scores of Wong-Baker Faces Pain Rating Scale mean scores in study group II (watching cartoons) compared with those in the control group.

Research design:

In the current study, a quasi-experimental design was adopted. Children were assigned to three equal groups study group I (buzzy), study group II watching cartoons group, and the control group merely received routine care without any intervention. Each group equally contained 50 children.

A quasi-experimental design is greatly compared to a true experimental design, with the exemption that the subjects are not randomly assigned to groups in a quasi-experimental design. Internal validity issues with quasi-experiments can emerge since the treatment and control groups might differ in pattern **(Grove & Gray, 2018).**

Sample

A purposive sample of 150 school-age children undergoing phlebotomy who conceded to the pediatric emergency units at Minia University Hospital for Obstetrics and Pediatrics (MUHOP). Children were divided into three equal groups study groupI (buzzy), study group II watching cartoons group and the control group received routine care without any intervention and each group contained 50 children.

Sample size:- Based on the following presumptions, we calculated that each group would require 50 patients: With a common standard deviation (SD) of 2, the cartoons group had a mean WBFP score of 4, the Buzzy group had a mean WBFP score of 6, and the control group had a mean WBFP score of 6 **(Bergomi,etal.,2018).**

Inclusion criteria:

- School-age children from 6 to 12 years old
- Children are undergoing phlebotomy without pain management
- First needle stick at admission

Exclusion criteria:

- Children with peripheral vascular diseases, connective tissue disorders, diabetic neuropathy, and alternate levels of consciousness.
- Children with chronic diseases or birth defects, central nervous system diseases, vision and hearing impairments.

Setting

The current study was carried out in the pediatric emergency units on the ground floor at MUHOP. The hospital receives children from all over the district of Minia complaining of various diseases and the total number of beds in the hospital is 300 beds. Pediatric emergency department includes 4 emergency rooms for children; it also concerned room for nurses and doctors.

Data Collection Tools:

The necessary information was gathered using two tools:

Tool one: A structured interview form in simple Arabic language was made by

the researcher after reviewing the related literature and divided into two parts:

Part one: Personal data of children and their mothers. It contained questions related to the personal data of children such as age, gender, rank, mothers' age and mothers' education. .

Part II: Medical data about child:-It involved questions such as the reason for admission, previous hospitalization, Previous venipuncture for last three months site of venipuncture and numbers of venipuncture

Tool two: Wong-Baker Faces Pain Rating Scale

It contained six cartoon faces from a neutral look (meaning there is no pain) to a screaming face (10- very much pain). Rate the chosen face 0, 2, 4, 6, 8, or 10, counting left to right; thus, "0" equals "No pain" and "10" = "Too severe pain"**(Foundation, 2016).** Children were instructed to depict their pain level by drawing a circle around their faces, which was subsequently converted into a number. The scale is a valid and reliable tool for determining procedure pain intensity. It is a self-reported scale appropriate for evaluating pain in children aged 3 to 18 old. Accessing the scale online has no copyright limitations **(Hockenberry & Wilson, 2009).**

Validity:

Three experts in pediatric nursing assessed the content validity of the data collection tool. Tools were evaluated for phrasing, topic coverage, clarity, applicability, and relevance. Little changes, such as rephrasing and phrase rearrangements, were done based on the suggestions and views of experts.

Reliability

The reliability of instrument one is evaluated using Cronbach's alpha ($\alpha = 0.792$) to assess how closely the components of the instrument are related to each other. Second Tool The use of Wong-Baker's Facial Pain Scale was tested by **Drendel, Kelly, and Ali (2011)**, with a Cronbach's alpha coefficient of 0.70.

Pilot Study:

Five children from each group who completed the inclusion requirements participated in the pilot study to assess the instruments' viability, impartiality, application, clarity, sufficiency, and content validity. Children who took part in the pilot study were a part of the study's overall sample.

Ethical Considerations:

First obtaining approval from research ethics committee for the faculty of nursing, the chairs of the pediatric emergency units and the director of MUHOP. The mothers of the children gave their signed, informed consent after being briefed about the goal and design of the study in order to gain their cooperation. Children and their mothers were informed that participation in the study was completely voluntary and that they had the right to leave at any time, without having to offer a reason or worry about how to care for their children. The privacy of each mother and her kid was maintained.

Procedure

Before the phlebotomy procedure:

Firstly the researchers bought the buzzy device online from web site (www.buzzy4shots.com).

Figure (1) buzzy device

Figure1 Reprinted from: https://www.buzzy4shots.com (2022)

The researchers introduced themselves to the children, their mothers, and the nurses involved in drawing blood samples, and the study's aim and data collection techniques were explained to them. Mothers and kids were shown the device (buzzy), enabled them to touch it and switch it on if they wanted. From September 2022 through December 2022, data was gathered.

Mothers gave their written informed consent after being requested to participate by the researcher. Using (tool I), the researcher conducted individual interviews with the kids and their mothers to get information about the traits of kids who satisfied the inclusion criteria. The interviews took place in the emergency unit's area next to where blood samples were being drawn for testing. After outlining the purpose and throughout the interview, the researcher taught each child and his mother how to use the pain assessment scale (Faces Pain Rating Scale). The interview lasted for roughly 30-35 minutes. In order to get the responsible nurse's cooperation and to save time and effort, the procedure was discussed with her.

For the control group (venipuncture without intervention):

Children in the control group received simply a routine venipuncture performed by the designated nurse in accordance with a physician's written order. The mother and researcher used the Wong-Baker Facial Pain Rating Scale to assess and record the child's pain level during the venipuncture process. Each child was asked to select the face on the Wong-Baker Faces Pain Rating Scale that best represented the degree of his pain immediately following the venipuncture

Buzzy group

In the Buzzy group, the device's wings were taken out of the freezer and quickly warmed up to prevent the child from feeling sick from exposure to the cold. According to the manufacturer's instructions, the device was applied 5 cm from the venipuncture site. The device was proximally wrapped in a venous tourniquet before being turned on to start the vibration. The needle has to be placed within 15 seconds of the device being put to the skin in order for the non-pharmacological intervention to be successful. The Faces Pain Rating Scale was used by the mother and researcher to gauge and record the child's pain level during the venipuncture process. Following the venipuncture, based on the Faces Pain Rating Scale, each child was asked to select the face that best represents the severity of his or her pain.

Watching cartoons group

The researcher provided a list of five cartoons, chosen for the Watching Cartoon Distraction group based on the child's age and gender. The kids selected their favorite cartoon (Tom and Jerry). Two minutes had passed since the animation began before the venipuncture was done. The Faces Pain Rating Scale was used by the mother and researcher to gauge and record the child's pain during the venipuncture process. Following the venipuncture, each kid was instructed to select the Faces Pain Rating Scale that best represented the level of pain he was experiencing.

Statistical Analysis

Social Science Statistics Package was used to code, categorize, tabulate, and analyze the obtained data (SPSS 20.0). The data were presented with descriptive statistics in frequencies and percentages for qualitative variables. Mean, stander deviation (SD) and Kruskal Wallis test was used to statistically significance between three groups and post hoc test. According to the data distribution, nonparametric tests were used to compare continuous variables. Fisher's exact test is applied to determine whether there is a link between qualitative variables and a small number of samples. Microsoft Excel was used to create graphs for data visualization. A result is considered significant if the P-value is less than or equal to 0.05; otherwise, it is considered non-significant.

Results:

Table (1) shows the personal data of children and their mothers who participated in the present study. 46% of the children are in the control group, 60% in the Buzzy group, and the highest percentage of them 70% in the Cartoons group; their ages ranged from 8-10

years, and their mean ages are 8.8±1.4, 9.01±0.99 and 9.1±0.86 years respectively. More than two-fifths (48%) of them in the control group ranked as the first child, while 52% and 54%of them in the buzzy group and cartoon group, respectively, ranked as the second child. In addition to mother age, this table showed that 56%in the control group and 62% and 68% of mothers in the Buzzy group and Cartoon group their ages ranged from 23-27 years with mean age was 24.7±2.4, 24.9 ±3.33 and 24.4 ±3.33 in three groups respectively. The highest percentage (78%, 72%, and 66%) of the mothers had Secondary education or diploma in control, buzzy and cartoon group. There were no statistically significant differences between the groups regarding personal data of children and their mothers.

Figure (1) illustrates that 60% of children in the control group were male. On the other hand, 56% and 52%of children in the buzzy and cartoons groups were female, with no statically significance among the three groups with no statistically significant differences between the groups.

Table (2) points out that 56% and 50% of the children admitted at emergency units with Respiratory symptoms in the control and buzzy groups, while 48% of them had GIT symptoms (diarrhea, vomiting, and dehydration) in the cartoons group. The majority (86%, 94 %, and 90%) of children had no previous hospital admissions in the control, buzzy and cartoons groups, respectively. It was observed from this table that 64% of the children in the control group and 78% and 74% respectively in the buzzy and Cartoon group had no history of venipuncture at the last three months**.** It was clear from this table that 82%, 90%, and 86% respectively in the control**,** buzzy and cartoons groups had venipuncture from the first time, with mean 1.2 ± 0.55, 1.14 ± 0.45, and 1.16 ± 0.42 respectively. There were no statistically significant differences between the groups regarding children's medical data.

Figure (2) demonstrates that the children majority in the control, fuzzy, and cartoons groups (82%, 78%, and 86%) underwent venipuncture from dorsal hand veins with no statically significance among the three groups.

Table (3) reveals that the mean score of the faces pain rating scale among children in the control group on the venipuncture site was 5.2 ± 1.7, reported by children decreased to 1.16 ± 1.56 after the application of buzzy and 2.5 ± 1.6 after watching cartoons. The mean total score of the facial pain rating scale reported by the researcher in the control group was 4.4 ± 2.04, reduced to 1.20 ± 1.5 after the application of buzzy and after watching the cartoons was 1.8 ± 1.3. Also this table clarified that the total mean scores of the faces pain rating scale among children in the control group on the venipuncture site reported by the mother was 5.7 ± 1.66, decreased to 1.36±1.48 after the application of buzzy, and after watching cartoons was 2.2 ± 1.4. Highly statistically significant differences were detected among children regarding the mean total scores of the faces pain rating scale in the control group and after the application of the buzzy device and watching cartoons. Also in this table it was found pain scores of the children in the Buzzy group were lowered than the children in the watching cartoons group with statically significance difference $p < 0.001$

Table (1): Distribution of the studied children and their mothers according to socio-demographic characteristics (n=150).

Variable	Control group (n=50)		Buzzy group (n=50)		Cartoon group (n=50)		X 2	p-value
	No.	%	No.	%	No.	%		
Child age/ year:								
6-<8	10	20	5	10	2	4	8.77	0.060 ns
8-<10	23	46	30	60	35	70		
10-12	17	34	15	30	13	26		
Age (mean ± SD)	8.8 ± 1.4		9.01 ± 0.99		9.1 ± 0.86		1.86	.0.390 ns
Child rank:								
First	24	48	22	44	23	46	7.72	.0.259 ns
Second	21	42	26	52	27	54		
Third	3	6	2	4	0.0	0.0		
Fourth	2	4	0.0	0.0	0.0	0.0		
Mother's age/year:								
18-22	15	30	10	20	10	20	3.40	0.75 ns
23-27	28	56	31	62	34	68		
28-32	6	12	8	16	6	12		
33-37	1	2	1	2	0	0		
Age (mean ± SD)	24.4 ±3.33		24.9 ±3.33		24.7±2.4		1.15	0.56 ns
Mother education:								
Not read and write	4	8	3	6	4	8	2.49	0.645 ns
Secondary or diploma	39	78	36	72	33	66		
Above secondary	7	14	11	22	13	26		

P – value was calculated by fisher exact test and Kruskal Wallis Test ns – non significant

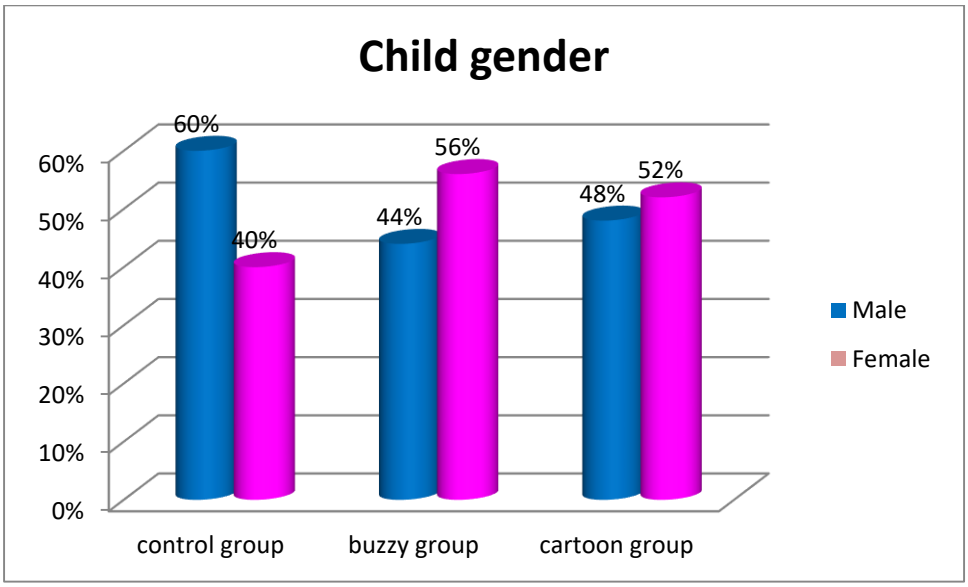

Figure (1): Distribution of the child's gender in the control, buzzy, and cartoons groups (n=150).

Table (2): Comparison between children's medical data in the control, buzzy, and cartoons groups (n=150).

Variable	Control group (n=50)		Buzzy group (n=50)		Cartoon group (n=50)		X 2	p-value
	No.	%	No.	%	No.	%		
Reason for admission ER:								
Respiratory symptoms	28	56	25	50	18	36	9.048	0.17 ns
GIT symptoms	15	30	16	32	24	48		
Fever	5	10	6	12	8	16		
Others	2	4	3	6	0.0	0.0		
Previous hospitalization:								
Yes	7	14	3	6	5	10	1.103	0.57 ns
No	43	86	47	94	45	90		
Previous venipuncture *(for the last three months)*:								
Yes	18	36	11	22	13	26	2.57	0.275 ns
No	32	64	39	78	37	74		
Numbers of venipuncture:								
One time	41	82	45	90	43	86	2.38	0.66 ns
Two	6	12	3	6	6	12		
Three or more	3	6	2	4	1	2		
Mean	1.2±0.55		1.14±0.45		1.16±0.42		1.30	0.52 ns

P – value was calculated by fisher exact test and Kruskal Wallis Test ns – not significant

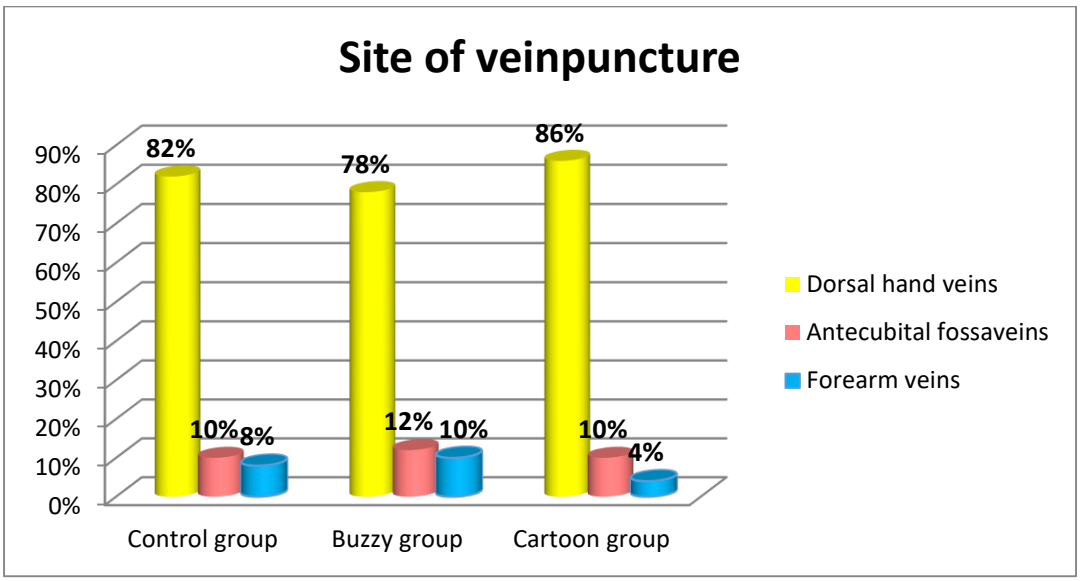

Figure (2): Distribution Site of Venipuncture among the Studied Children in the control, buzzy, and cartoons groups (n=150).

Table (3): Comparison mean total Faces Pain Rating Scale scores among Children in the control, buzzy, and cartoons groups (n=150).

Face Pain Rating Scale	Control Group (n = 50)a	Buzzy group (n = 50)b	Cartoon group watching (n = 50)c	X 2	P-value	Post-hoc Test
Child self-reported pain	5.2 ± 1.7	1.16 ± 1.56	2.5 ± 1.6	77.4	0.0001**	a > c > b
Researcher-reported pain	4.4±2.04	1.20±1.5	1.8±1.3	60.8	0.0001**	a > c > b
Mother-reported pain	5.7 ±1.66	1.36±1.48	2.2±1.4	87.6	0.0001**	a > c > b

P- value was calculated by Kruskal Wallis Test Post-hoc Test ** Highly statistically significant at p=<0.001

Discussion

The current study hypothesized that Children in study group (Buzzy) and (watching cartoons) group will have less procedural pain during phlebotomy than children in control group.

According to the study's findings it was found the Buzzy was the most effective strategy for reducing pain among children during blood sampling procedure. This might be due to the gate control theory which suggests that pain is transmitted from the peripheral nervous system to the central nervous system, where it is modulated by a gating system in the dorsal horn of the spinal cord. The afferent pain-receptive nerves are blocked by fast non noxious motion nerves. Prolonged cold stimulates the C fibers and may further block the A-delta pain signal (**Fathalla & Bayoumi, 2018)**.

watching cartoon is type of distraction techniques that has significant role in pain control because, it provokes children curiosity to use their auditory, visual, tactile and kinesthetic sense and seeks to focus a child's attention on interesting or challenging tasks to avert the attention from painful or distress medical procedures **(Maharjan, et al., 2017).**

So, Buzzy and watching cartoon are one of most effective, inexpensive and easy non pharmacological method for pain reliving among children undergoing needle related procedures especially in emergency department.

According to the current study's findings, the characteristics of the children who were the participants in the study showed that their mean age in the control group was 8.8±1.4, in the buzzy group, was 9.01±0.99 years, while in the cartoon group was 9.1±0.86years. These results were supported by an Italian study by **Bergomi et al. (2018)** to evaluate the efficacy of buzzy, animated cartoons and the combined effect of buzzy, animated cartoons among 150 children during venipuncture. The study results assured that children mean age in the control group was 9.4 ± 2.3, in the buzzy group was 8.3 ± 2.2, and the animated cartoon was 9.4 ± 2 years. The current study's findings agreed with study done by **Gerçeker et al. (2018)** to assess how watching cartoons and using external cold and vibration methods during phlebotomy affected children's pain levels. It found that Children's mean age in the control group was 8.9± 1.3, in watching cartoons was 9.7±1.5 and in external cold and vibration was 9.7 ± 1.6.

On the other hand, a recent Turkish study by **Davas and Kürtüncü (2021)** to examine the effect of three different strategies (buzzy, digital game, cartoon) on child pain management and parental satisfaction during blood collection found that mean age in the buzzy group was 7.3±1.7 years while in cartoon group was 7.01±1.88 years**.**

The results of the current study revealed that more than half of the children being studied were females. These findings were corroborated by a related Italian study conducted by **Bergomi et al. (2018)**, which showed that the buzzy and cartoon group of children had more female participants than male participants.

Similarly, **Tork (2017)**, in an Egyptian study of 180 children, used Buzzy, balloon inflation, and distraction cards to examine pain and anxiety levels in children undergoing phlebotomy and observed that 53.3% of the children in the Buzzy group were female.

The results of this study were consistent with those of a recent study by **Kamlesh et al. (2021)** that evaluated the effect of cartoons on pain relief during painful procedures in children and found that 60% of the children were female. Otherwise, the results of a study conducted by **Semerci et al. (2023)** show how buzzy, cold spray affects pain, distress, and anxiety in children during venipuncture in the pediatric emergency department revealed that half of children in the buzzy group were male. Concerning the personal data related to the mothers of the studied children, the current study results proved that the mothers' mean age was 24.4 ± 3.33 in the control group, 24.9 ± 3.33 in the buzzy 24.7±2.4 years in the cartoon group. These results disagree with the results of the study carried out by **Bergomi et al. (2018),** who found that mother mean age was 40.5 ± 5.2 years in the control group, 40.8 ± 4.7 years in the buzzy, and 39.4 ± 5.9 years.

According to the current study, the highest percentage of the mothers had Secondary education or diploma in control, buzzy and cartoon group. This result reflects the high literacy rate of the mothers participating in the current study. This result were consistent with the Egyptian study done by **Fathalla and Bayoumi (2018)** to determine the effect of cryotherapy and thermo-mechanical stimulation on pain, anxiety, and satisfaction in children during blood collection. The study assumed that the highest percentage of mothers had secondary education.

These results were consistent with a research study conducted by **Kamlesh et al. (2021),** who found that 73.3% of mothers had had secondary education. **The Egypt Demographics Profile (2021)** confirmed that Egypt had made considerable strides toward eliminating the gender gap in educational achievement. According to 2015 data, the educational achievement levels of boys and girls in the 15–19 age range are significantly closer than they were for earlier generations. But the literacy rate for women increased from 63.5% in 2016 to 65.5% in 2017. Governmental and non-governmental groups should therefore concentrate their efforts on educating women, especially in Upper Egypt. This is reflected positively in the overall health system and the care of sick children, as low literacy rates can hinder economic development in today's environment with rapid change and technological progress.

With regard to the reason for admission emergency department, the results of current research showed that greater than half and two-quarters of children admitted at emergency units with Respiratory symptoms in the control and buzzy groups, while more than two-fifths of them had GIT symptoms (diarrhea, vomiting, and dehydration,) in cartoon group. This result goes with harmony to a study conducted by **Kamlesh et al. (2021),** who found that 46.7%, 36.7%, and 33.3% of children had Respiratory symptoms at admission in the control, buzzy and cartoons groups, respectively.

The current results showed that the majority of children had no previous hospitalization in the control, buzzy, and cartoons groups, respectively. In the same line, **Tork (2017)** found that majority of children had no previous hospitalization in control and buzzy, respectively. Regarding previous venipuncture, at the last three months, the current study found that more than two-thirds of the children in the control group and the highest percentage of children in the buzzy and cartoon groups had no venipuncture-related medical history in the past three months. These results were consistent with those of a study conducted by **Fathalla and Bayoumi (2018)**, who reported the highest percentage of children, had no history for venipuncture- in the past three months in control and buzzy children. These results were consistent with a study by **Kamlesh et al. (2021),** who found that more than half of children in the control and animation groups had no previous venipuncture experience.

Concerning the number of venipuncture, the current results showed that the majority of children in the control**,** buzzy, and cartoons groups had venipuncture from the first time in groups respectively. These results are inconsistent with those of **Bergomi et al. (2018)** found that more than one third of children had venipuncture 2-4 times in the

control, buzzy, and cartoons groups, respectively.

The current results show that the highest percentage of children in control, buzzy, and cartoon groups had venipuncture from the dorsal hand veins with no statistically significance among the three groups. These results agree with the study by **Tork (2017),** who found that majority of children in the control and buzzy groups made blood collection from dorsal hand veins. In the same side, **Kamlesh et al. (2021)** found that more than two thirds of children in the control and animated cartoons groups made blood drawing from hand veins.

The current study's findings revealed that mean scores of the Wong-Baker Facial Pain Rating Scale were significantly decreased in the buzzy group and the watching cartoons group than in the control group with highly statically significance($p<0.001$). It also, present results revealed that the children in the buzzy group had significantly lower pain levels reported by the child to (1.16±1.56), researchers reported (1.20±1.5) and mothers reported (1.36±1.48) than the control group.

This finding came in agreement with **Tork (2017),** who reported that the distraction method through Buzzy, distraction cards and balloon inflating are effectively decreased children pain levels compared with the control group according to self-report, parent-report and observer-report with statistically significant differences between the groups $p= 0.012$, $p= 0.036$, $p= 0.014$ respectively).

Moreover, this result was in the same line with **Bergomi et al. (2018),** who conducted study among 150 children undergoing venipuncture to determine the effect of Buzzy device, animated cartoon and the combined effect of Buzzy and an animated cartoon. They reported that buzzy and animated cartoon were effectively in reducing pain during venipuncture.

Moreover, this result was consistent with **Fathalla & Bayoumi (2018)** who conducted a research about the effect of thermomecanical Stimulation (Buzzy) and cryotherapy on children pain, anxiety and satisfaction during blood specimen collection added that Children in the study group (buzzy) had lower pain and anxiety than children in control group who received routine hospital care highly statistically significant differences in the mean pain scores of the children in all groups.

This result came in agreement with the **Redfern et al. (2018)** who examine the effectiveness of the Buzzy device compared to no intervention in control group in reducing child pain during immunization. They concluded that buzzy device significantly reduced pain during pediatric immunization over a wide range of ages compared to control.

Furthermore, the study was done by **Wai et al. (2020)** to evaluate the effect of cold application on venipuncture pain among 124 children at the Outpatient Department in Yangon Children

Hospital who revealed that the combination of cold application on site of venipuncture before intervention and distraction during venipuncture until the end of the procedure had the strongly significant effect on prevention and reducing the pain from venipuncture among children and added that use of buzzy was simple, easy, inexpensive and effective to use in clinical practice providing the physical and emotional comfort in children

Similarly, a recent study conducted by **Semerci et al. (2023)** who conducted study to evaluate the effect of Buzzy and cold spray in reducing pain, anxiety, and fear of children during venipuncture in the emergency department and revealed that Buzzy and cold spray reduced pain and fear in children aged 5 to 12 during phlebotomy at the pediatric emergency department more effectively than standard care.

Conclusion

Based on the current study's findings, it was concluded that the mean total scores of the Wong-Baker Faces Pain Rating Scale were markedly decreased after using buzzy and watching cartoons in study groups than those in the control group among school children undergoing phlebotomy. Also it was found pain scores of the children in the Buzzy group were lowered than the children in the watching cartoons group with statically significance difference $p < 0.001$. The present study has

shown that the appropriate non-pharmacological pain management techniques are simple, easy, inexpensive, and effective in clinical practice providing physical and emotional comfort in children

Recommendations

In light of the current study's findings, the following recommendations were suggested:

Pediatric healthcare units should integrate buzzy and watching cartoons to manage needle puncture pain in routine care for children undergoing venipuncture procedures.

A training course is held for pediatric nurses about the effect of buzzy and watching cartoons as a non-pharmacological pain management strategy during phlebotomy and other invasive procedures.

Further research must utilize a randomized controlled trial with a placebo to support this procedure's benefits further.

Further studies are needed to compare buzzy and watching cartoons' impact with other non-pharmacological pain management methods, such as relaxation, distraction, and play in managing pain among children undergoing phlebotomy.

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