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Original Article

Effect of Vibrating Cold Application Versus Stress Ball Distraction on Children's Physiological Parameters, Pain and Stress During Phlebotomy

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ABSTRACT

Pain is one of the worst experiences of pediatric patients due to various medical interventions, often contributing to pain and distress. Pain awareness is influenced by the child's age, cognitive level, communication skills, and previous pain experiences. Phlebotomy and vascular puncture are the most common invasive measures used for children. Distraction is one of the non-pharmacologic methods with the greatest level of evidence used to diminish pain following invasive procedures in children. Vibrating cold and stress balls are cognitive distraction methods**. Aim:** evaluate the effect of vibrating cold application versus stress ball distraction on children's physiological parameters, pain, and stress during Phlebotomy. **Subjects & Setting** Randomized Sampling of 75 children from Pediatric Medical and Hematology departments at Tanta Main University Hospital. **Tools: Tool I**: Children's bio-social characteristics and their physiological parameters, **Tool II:** Wong-Baker Faces Pain Rating Scale & **Tool III:** Children's behavioral distress observational checklist. **Results:** total mean scores of Wong-Baker Faces Pain Rating Scale & behavioral distress were lower among children in vibrating cold application compared to the other two groups. **Conclusion:** vibrating cold application and stress ball are effective in reducing pain and behavioral distress during phlebotomy. **Recommendation**: Educational programs should be conducted for pediatric nurses regarding the use of vibrating cold and stress balls during phlebotomy.

Keywords: Vibrating Cold, Stress Ball, Physiological Parameters, Pain & Phlebotomy

Introduction

Children at different stages of their lives are vulnerable to various injuries or diseases that may lead to hospitalization and that require a lot of invasive procedures that may painful and stressful for children. One of the more unpleasant effects of many medical procedures on children is pain, which often leads to anxiety and stress. Phlebotomy is one of the most important invasive procedures for children. It can be described as a

procedure in which a needle is used to obtain blood from a vein, typically for laboratory testing. Phlebotomy may also be conducted to extract extra red blood cells from the blood for the treatment of specific blood conditions. It is also called blood collection and venipuncture. Insertion of a needle is one of the most frightening and distressing medical techniques for hospitalized children. (**Ugucu et al, 2022& Turgut et al, 2022)**

Nurses have a responsibility to minimize the pain experienced by children who are subject to painful procedures and to assist them in the management of pain. Pain relief is achieved through pharmacological and non-pharmacological methods. The non-pharmacological method is to be thought of as a creative strategy to reduce pain. Distraction is considered one of the non-pharmacologic interventions with the highest level of evidence used to mitigate pain following an invasive procedure in children. **(Yıldırım et al, 2023& Wang et al, 2022).**

It distracts the child's awareness from the injection and associated pain. Distraction also leads the areas of the brain that handle the stimulus of pain to be less active to the pain of injections while being distracted. This can be applied using many distractors such as vibrating cold and stress ball **(Bergomi et al, 2018& Semerci et al, 2020).** Both methods are designed to temporarily distract the brain from the pain and the child may not be aware of the injection by placing little, nerve-stimulating pressure on the injection site. **(Crevatin 2021)**

Vibrating cold can be applied by using a buzzy bee device. Buzzy is an advanced medical device that integrates external skin cooling with vibration. The device combines cold application, tactile warning, and distraction approaches with an ice pack and vibrating motor. **(Casale et al, 2022**) Combination of external cold application and vibration, this technique inhibits peripheral nerve transmission by cold application and reduces pain levels according to the theory of gate control. **(Yılmaz et al, 2020).** Within these non-pharmacological modalities, the use of stress balls as a cognitive distraction tool has become increasingly popular in pain and anxiety management. It is an elastic ball that can be grinded by the child during phlebotomy. It is also soft and pliant to be handled easily by the child. (**Dinis et al, 2023 & Soltani et al, 2023)**

Significance of the study:

Children with phlebotomy have repeated injections as a part of treatment throughout a period of time. Repeated injections cause pain, and anxiety and may cause children to refuse to get injected. Non-pharmacologic methods, such as vibrating cold application and stress ball distraction devices, can be used for the reduction of pain and anxiety associated with phlebotomy. Because they are inexpensive and effective, they can be an excellent choice for nurses. **(Yıldırım et al, 2023& Schreiber et al 2020).**

Aim of the study

The study aimed to evaluate the effect of vibrating cold application versus stress ball distraction on children’s physiological parameters, pain and stress during Phlebotomy.

Research Hypotheses:

H1: Children's physiological parameters are expected to be improved after application of vibrating cold and stress ball during phlebotomy

H2: Children's pain and behavioral distress are expected to be decreased after the application of vibrating cold and stress ball during phlebotomy.

H3: Vibrating cold application is expected to be more effective in reducing children's pain and behavioral distress than stress ball during Phlebotomy.

Subjects and Method

Research design

A randomized control experimental design was utilized in the current study

Setting

The study was conducted at the Pediatric Medical and Hematology departments at Tanta Main University Hospital which is affiliated to the Ministry of Higher Education and Scientific Research.

Subjects: Randomized sample of 75 children from the above settings. They were randomly distributed. A type I error of 0.05 and a confidence level of 95% were used to calculate the study and control groups.

Based on simple random coding, they were assigned to three groups:

1- **Vibrating cold group: Twenty-five children**: It can be done by a buzzy bee device which is fixed on the arm of the child where the phlebotomy is done on the child. It reduces the pain by its cold wings and vibration. It was attached 5 cm above the site where the blood was to be drawn, the nurse performed a phlebotomy after holding it for 15 seconds.

2- **Stress ball group**: **Twenty-five children**. Children were given a stress ball and asked to tighten and loosen it in their palms while counting to five during the procedure.

3- **Control group**: **Twenty-five children:** Routine phlebotomy was performed on those children without any intervention.

Inclusion criteria:

- Children aged 3-10 years old
- Children with no psycho-neurological disorders or mental retardation.

Tools of data collection: Three tools were used in this study:

Tool I: Children's bio-social characteristics and their physiological parameters:

Part I: Children's bio-social characteristics (age, sex, residence, medical diagnosis, number of phlebotomy, and time since the last phlebotomy).

Part II: Children's Physiological Parameters (respiratory rate, heart rate, o_2 saturation).

Tool II: Wong-Baker Faces Pain Rating Scale (WBFPRS): Wong-Baker FACES Foundation (Wong., 2016). The Facial Expression Rating Scale includes 6 facial expressions ranging from smiling to crying. The "0" point equals "no pain" and the "10" point equals "the worst possible pain". The scale is used for children who are conscious, and able to communicate. This scale needs no words or

numerical data and is a consistent and valid measurement tool in the rating of acute pain.

Facial expressions range from:

- A smiling “brutal” face: means score (0)
- It hurts a little: means score (1-2)
- It hurts a little more: means score (3-4)
- It hurts even more: means score (5-6)
- It hurts a lot: means score (7-8).
- It hurts worst: means score (9-10).

Scoring system: -

- (0) means Relaxed and comfortable.
- (1-3) means Mild discomfort.
- (4-6) means Moderate discomfort/pain.
- (7-10) means Severe discomfort/pain.

Tool III: Children's behavioral distress observational checklist (Carlson et al ,2017)

It has been used to check on children according to the degree of distress they show during procedures that reveal discomfort. (crying, screaming, physical restraint, verbal resistance, emotional support, information seeking, verbal pain, and flailing) at 15-second intervals throughout the procedure. Scores were summated for each 15-second interval within the procedure and then were divided by the number of intervals to determine a mean score. Each item was classified into (4) points according to the severity of distress whereas:

Four for severe distress.

Three for moderate distress.

Two for mild distress.

One for no distress.

The total score of children's behavioral distress was classified as follows:

70 and more were considered in severe distress.

70- < 60 was considered moderate distress.

60 <50 was considered mild distress.

Less than 50% was considered no distress.

Methods

-Official approval has been gained from the director of the Faculty of Nursing and Pediatric Medical and Hematology Departments at Tanta Main University, after identifying the objective of the study and establishing the time for the beginning of the study.

-Ethical approval was granted from the Research Ethics Committee of the Faculty of Nursing, Tanta University with the code number 541-10-2024.

-The whole sample did not suffer any harm or pain due to the nature of the study. Confidentiality and security of data collection have been considered.

-Mothers agreed to enroll their children in the study after being provided with information about the study objectives and the option to terminate their participation at any time.

- **The study tools** were constructed by reviewing the corresponding literature: three tools were used. Tool I, II, III-

-**Tools Validity**: Five pediatric nursing experts rated the content validity, clarity, appropriateness, comprehensibility, usability, and Simplified implementation of the study instruments. The content validity index was 98.5%.

-**Reliability of tools:** The reliability of the tools under development has been assessed by means of internal consistency and Cronbach's alpha was 0.881.

-In order to examine the clarity, applicability, and feasibility of the tool, a pilot **study** was applied to 10% of the selected sample. The suitable changes were done and the data from the pilot study were not considered in the study.

-The study was done within four months from October 2024 to January 2025.

Phases of the study

-**Assessment Phase:** It was administered by the researcher to all subjects in the study, to obtain baseline data and to assess the child who met the inclusion criteria of this study and the child's biosocial characteristics. The researcher began by describing the purpose of the study to the mothers of the children to gain their cooperation. (Tool 1part I&II)

-Planning Phase:

- Researcher begins to perform specific code for each child.

- Preparing a safe and private environment, needed equipment such as vibrating cold device and stress ball and children

- Implementation Phase:

-The researcher was present at the place of the study and applied the procedure of vibrating cold and stress ball children in each group prior to and during phlebotomy.

- The researcher uses Tools I, II & Tool III to collect data from the three groups.

- Phlebotomy was performed on all children by a unique nurse. It was ensured that the same nurse was to avoid variation in practice.

- study groups were:

Figure (1): Sapçi , p., Kocamaz , E., Gungormus , Z., (2020). Effects of applying external cold and vibration to children during vaccination on pain, fear, and anxiety. Journal of Complementary Therapies in Medicine, 58(10), 2688.

Group (1): vibrating cold application

First, the researcher froze the ice wings of the device for 10 minutes before starting the procedure, then cleaned it with 70% alcohol, and then attached the ice wings with the buzzy vibration. The researcher placed the device on the site of the injection for phlebotomy for 30-60 seconds to provide the cryotherapy effect through cold gel packages. Move and secure the buzzy 2-5 cm from the injection site during the procedure. The researcher evaluates the child’s physiological parameters, pain level, and behavioral distress

before and during phlebotomy by using (tool I part II, tool II, III).

Figure (2): Soltan, Pi ., Moaddabi, A., Dezfuli , M., Ebrahimikiyasari, , Hosseinnataj,A ., Rengo, S ., i Tafti, K., Spagnuolo, G., (2023). Evaluating the effect of using anti-stress balls as a distraction technique in reducing pain during inferior alveolar nerve block injection: a randomized clinical trial riar, Journal of Epub, 27(8):4653-4658.

Group (2): stress ball

A stress ball was given to children and the researcher asked them to tighten and loosen the stress ball in their palms while counting to five during the procedure. The researcher evaluates the child's physiological parameters, pain level and behavioral distress before and during phlebotomy by using (tool I part II, tool II, III).

Group (3): control group

The researcher collected the data from the control group, which did not receive any intervention during the phlebotomy other than the usual care. The researcher evaluates the child's physiological parameters, pain level and behavioral distress before and during phlebotomy by using (tool I part II, tool II, III).

-Evaluation Phase:

Evaluation was performed by the researcher for each child regarding physiological parameters, pain level, and behavioral distress before and during phlebotomy by using (tool I part II, tool II, III).

Statistical analysis:

The collected data were organized, tabulated, and statistically analyzed. using SPSS software (Statistical Package for the Social Sciences, version 26, SPSS Inc. Chicago, IL, USA). For quantitative data, the range, mean and Standard deviation was calculated. For qualitative data, which describes a categorical set of data by frequency, percentage or proportion of each category comparison between two groups and more was done using Chi square test ($\chi 2$). For comparison between more than two means of parametric data, F value of ANOVA test was calculated. Correlation between variables was evaluated using Pearson's correlation coefficient (r). Significance was adopted at $P < 0.05$ for the interpretation of results of tests of significance, highly significance was adopted at $P < 0.001$ for the interpretation of results of tests of significance **(White,2019)**

Results

Table (1): shows the distribution of studied children related to their bio-social characteristics. It was evident that the mean children's age in the three groups was from 3-10 years. Regarding their age, it was found that 52.0 % and 60.0% of children were female in both the vibrating cold application group and stress ball group respectively. While 56.0 % of children were male

in the control group. It was clear that 60.0% of children in the vibrating cold application group were from rural, while 60.0% and 56.0 % of them in the stress ball group and control group respectively were from urban. Children were diagnosed with respiratory tract infection and asthma in the vibrating cold application group was 20.0 % in each diagnosis. It was found that children who were diagnosed with tetralogy of Fallot and diabetes mellitus in the stress ball group were 16.0 % in each diagnosis, while favism, diabetes mellitus, and Asthma were the diagnoses in each 16.0 % of children in the control group. It was noted that 96.0%, 64.0%, and 84.0% of children had one-time phlebotomies for three months in the vibrating cold application, stress ball group, and control group respectively.

Table (2): illustrates the total mean score of studied children related to their physiological parameters in three groups. It was observed that the mean heart rate was 97.680 ± 1081, 97.800 ± 2.69 & 97.440 ± 2.12 in vibrating cold, stress ball, and control groups respectively before phlebotomy. While it was improved to become 86.200 ± 5.53in vibrating cold while still high at 96.960 ± 1.48 & 97.080 ± 1.80 in the stress ball and control group respectively during phlebotomy. Regarding the respiratory rate, it was noted that the mean was 30.160 ± 1.06, 30.240 ± 1.23 &30.280 ± 0.97 in the vibrating cold, stress ball, and control group respectively before phlebotomy. While it became 22.840 ± 1.99, 27.480 ± 2.27& 29.240 ± 1.71 in the three groups respectively. There was no change in oxygen saturation before and during phlebotomy in all three groups. A highly statistically significant difference was found between vibrating cold and stress ball groups during phlebotomy as p=0.0001**

Figure (3): shows the percentage distribution of studied children related to Wong-Baker Faces Pain Rating Scale during phlebotomy for the three groups. It was clear that 64.0 % of children in the vibrating cold group represented mild discomfort during phlebotomy while 40.0 % and 60% of children in both the stress ball and control group represented severe discomfort during phlebotomy respectively. There was a highly statistically significant difference during phlebotomy in vibrating cold application, stress ball, and control group as P value = 0.0001** with total mean scores 2.960 ± 1.83, 5.320 ± 2.23 and 6.800 ± 2.27 respectively.

Table (3): shows percentage distribution and total mean score of studied children related to their behavioral distress during phlebotomy for the three studied groups. It was observed that 52.0 % and 24.0 % of children had mild and moderate behavioral distress respectively during phlebotomy in the vibrating cold group. While 32.0 % and 40.0 % of them had moderate to severe behavioral distress respectively during phlebotomy in the stress ball group. It was noted that 28.0 % and 52.0 % of children had moderate to severe behavioral distress respectively during phlebotomy in the control group with highly statistically significant differences as P = 0.0001** with mean values 14.920 ±3.35**,** 17.960 ± 4.19 &19.560 ± 3.42 respectively.

Table (4): illustrates a correlation between Wong-Baker Faces Pain Rating Scale, and children's behavioral distress during phlebotomy for the three studied groups. It was clear that there were statistically positive correlations between the level of pain and level of behavioral distress for vibrating cold and stress ball groups as p =.0.002** & 0.039* respectively.

Table (1): Distribution of studied children related to their bio-social characteristics (n=75)

Children's Bio social-characteristics	Vibrating Cold Application Group (n=25)		Stress Ball Group (I) (n=25)		Control Group (II) (n=25)		χ 2 P
	No	%	No	%	No	%	
Age (years):							
3 - 6	15	60.0	16	64.0	13	52.0	0.770
7 – 10	10	40.0	9	36.0	12	48.0	0.681 NS
Range	**3 – 10**		**3 – 10**		**3 – 10**		**F value, P**
Mean ± SD	**6.320 ± 2.03**		**5.840 ± 2.42**		**6.080 ± 2.36**		0.277, 0.759 NS
Sex							
Male	12	48.0	10	40.0	14	56.0	1.282
Female	13	52.0	15	60.0	11	44.0	0.527 NS
Residence:							
Rural	15	60.0	10	40.0	11	44.0	2.244
Urban	10	40.0	15	60.0	14	56.0	0.326 NS
Medical Diagnosis							
Nephrotic Syndrome	2	8.0	2	8.0	1	4.0	
Favism	3	12.0	3	12.0	4	16.0	
ITP	3	12.0	3	12.0	2	8.0	
Tetralogy of Fallot	3	12.0	4	16.0	3	12.0	
Diabetes Melilites	2	8.0	4	16.0	4	16.0	10.015
Respiratory Tract Infection	5	20.0	3	12.0	3	12.0	0.931 NS
Asthma	5	20.0	3	12.0	4	16.0	
Nephritis	0	0.0	2	8.0	1	4.0	
Aortic Stenosis	0	0.0	1	4.0	1	4.0	
Atrial Septal Defect	0	0.0	0	0.0	2	8.0	
Number of phlebotomies since three months							
One time	24	96.0	16	64.0	21	84.0	9.073
Two times	1	4.0	6	24.0	2	8.0	0.059 NS
Three or more	0	0.0	3	12.0	2	8.0	
Time since the last phlebotomy							
1 Day	15	60.0	11	44.0	12	48.0	
2 Days	3	12.0	8	32.0	5	20.0	5.459
3 Days	4	16.0	5	20.0	6	24.0	0.708 NS
4 Days	1	4.0	1	4.0	1	4.0	
5 Days	2	8.0	0	0.0	1	4.0	

NS Not Significant

Table (2): Total Mean Score of studied children related to their physiological parameters in vibrating cold application, stress ball and control groups (n=75).

Physiological parameters	Vibrating cold application Group (n=25)	Stress Ball Group (n=25)	Control Group (n=25)	F value P
	Range Mean ± SD	Range Mean ± SD	Range Mean ± SD	
Heart Rate				
Before phlebotomy	96 – 104 97.680 ± 1081	95 – 107 97.800 ± 2.69	94 – 105 97.440 ± 2.12	0.160 0.846 NS
During phlebotomy	77 – 98 86.200 ± 5.53	94 – 101 96.960 ± 1.48	94 – 102 97.080 ± 1.80	**81.045** **0.0001****
Respiratory Rate				
Before phlebotomy	28 – 33 30.160 ± 1.06	28 – 33 30.240 ± 1.23	28 – 33 30.280 ± 0.97	0.077 0.926 NS
During phlebotomy	18 – 27 22.840 ± 1.99	22 – 30 27.480 ± 2.27	25 – 32 29.240 ± 1.71	**67.811** **0.0001****
O_2 Saturation				
Before phlebotomy	94 – 99 95.680 ± 1.21	94 – 99 95.880 ± 1.33	94 – 99 95.840 ± 1.34	0.166 0.847 NS
During phlebotomy	95 – 99 95.960 ± 1.13	94 – 99 95.640 ± 1.28	94 – 99 95.640 ± 1.28	0.969 0.384 NS

*** Significant Difference at (P<0.05), ** Highly Significant Difference at (P<0.01), NS Not Significant**

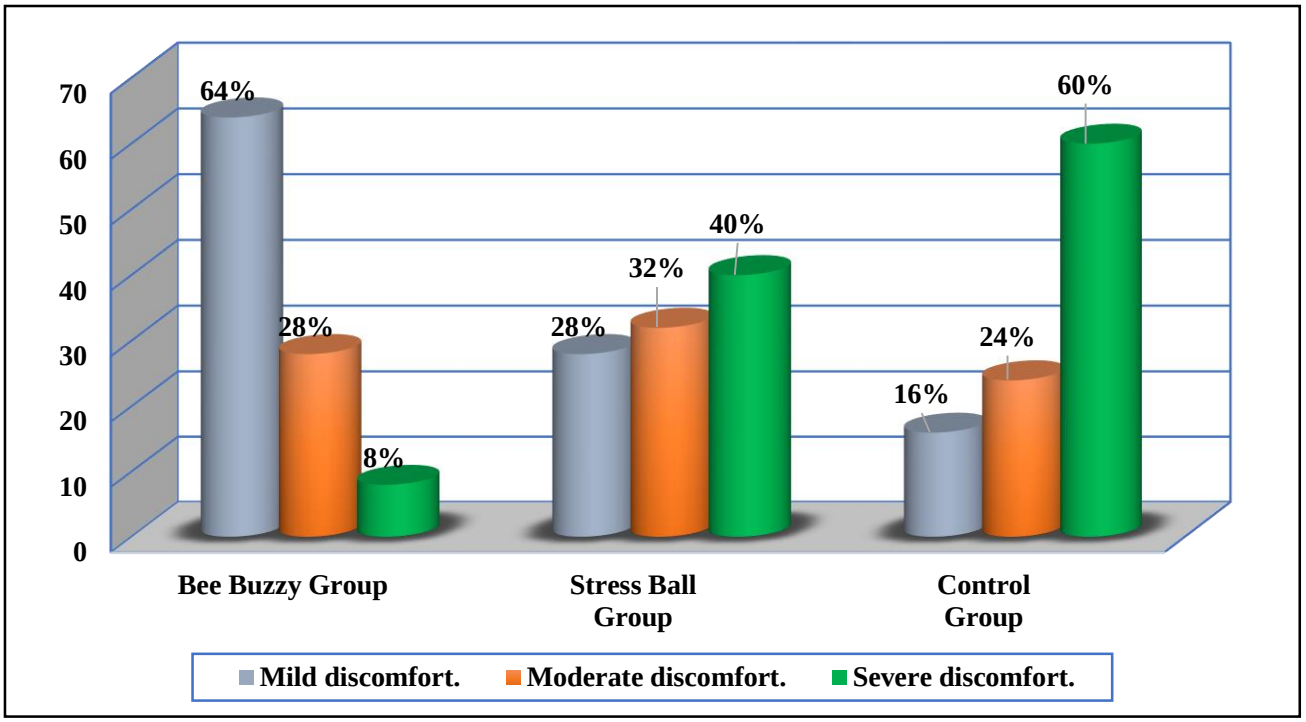

Figure (3): Percentage distribution of studied children related to Wong-Baker Faces Pain Rating Scale during phlebotomy for the three studied groups.

Table (3): Percentage distribution and total mean score of studied children related to their behavioral distress during phlebotomy for the three studied groups (n=75)

Children behavioral distress	The studied children (n=75)						χ^2 P (I)	χ^2 P (II)	χ^2 P (III)
	Vibrating Cold Application Group (n=25)		Stress Ball Group (n=25)		Control Group (n=25)				
	No.	%	No.	%	No.	%			
During phlebotomy									
No distress	4	16.0	2	8.0	0	0.0			
Mild distress	13	52.0	4	20.0	6	20.0	**11.948**	**13.799**	2.510
Moderate distress.	6	24.0	8	32.0	7	28.0	**0.008**	**0.003**	0.473
Severe distress.	2	8.0	11	40.0	12	52.0	**	**	NS
Total mean score of distress									
Range	6 – 20		6 – 23		14 – 25		**F value = 10.256**		
Mean ± SD	14.920 ± 3.35		17.960 ± 4.19		19.560 ± 3.42		**P = 0.0001****		

I Vibrating Cold v/s Stress Ball II Vibrating Cold v/s Control III Stress Ball v/s Control

*** Significant Difference at (P<0.05), ** Highly Significant Difference at (P<0.01),**

NS Not Significant

Table (4): Correlation between Wong-Baker Faces Pain Rating Scale, and children's behavioral distress, during phlebotomy for the three studied groups (n=75)

Children behavioral distress	Wong-Baker Faces Pain Rating Scale						r P
	Mild discomfort.		Moderate discomfort.		Severe discomfort.		
	No.	%	No.	%	No.	%	
Vibrating cold application Group							
No distress	2	8.0	2	8.0	0	0.0	
Mild distress	9	36.0	4	16.0	0	0.0	**0.598**
Moderate distress.	5	20.0	1	4.0	0	0.0	**0.002****
Severe distress.	0	0.0	0	0.0	2	8.0	
Stress ball group							
No distress	0	0.0	2	8.0	0	0.0	
Mild distress	1	4.0	1	4.0	2	8.0	**0.415**
Moderate distress.	2	8.0	5	20.0	1	4.0	**0.039***
Severe distress.	4	16.0	0	0.0	7	28.0	
Control group							
Mild distress	2	8.0	1	4.0	3	12.0	0.225
Moderate distress.	2	8.0	3	12.0	2	8.0	0.280
Severe distress.	0	0.0	2	8.0	10	40.0	NS

*** Significant Difference at (P<0.05), ** Highly Significant Difference at (P<0.01),**

NS Not Significant

Discussion

Pain remains the most complex, distressing, and challenging sensory-emotional phenomenon in children's lives **(Semerci., et al., 2023).** Phlebotomy is one of the main invasive procedures for children. It can be described as a procedure in which a needle is used to obtain blood from a vein, typically for laboratory testing. Distraction is one of the non-pharmacologic methods with the best level of strength of evidence used to alleviate pain related to invasive procedures in children. **(Ugucu., et al., 2022)** Non-pharmacological interventions, such as cold vibration and stress balls, are safer than other interventions and have little or no adverse side effects. **(Gurda., et al., 2022)**

As regards the mean score of studied children related to their physiological parameters in both vibrating cold and stress ball groups**.** It was found that there was an improvement in heart rate and respiratory rate during Phlebotomy during the application of vibrating cold and stress ball but more in the vibrating cold group. This may be due to the positive effects of using these distraction methods on the cognition of children and vibrating cold has also a cryotherapy and cold effect. **Fooladi., (2019)** found that there were changes in the heart rate before and after distraction suggesting a decreasing trend in the intervention group, resulting in more stable conditions with statistical significance and this was in agreement with the results of the present study. The results of **Kozlowski., (2018)** who mentioned that the pulse rates and breath rate of the distraction techniques groups were lower than in the control group during inhalation therapy were also on the same line with the present study.

The present study revealed that there was no change in oxygen saturation in children in both groups of vibrating cold and stress ball before and during phlebotomy. This may be due to oxygen saturation was high a little before the application of vibrating cold and stress ball, so its effect was not obvious on it. This result disagreed with the results of **Sajedi et al., (2017)** who concluded that non-pharmacological methods of pain control like distraction could significantly influence SaO_2 so that children in the intervention group experienced more stable conditions in terms of arterial blood oxygen saturation after undergoing painful procedures.

The current study demonstrated that around two-thirds of children in the vibrating cold application group had mild discomfort or pain during phlebotomy. While more than one-third and two-thirds of children in both stress ball and control groups had severe discomfort or pain during phlebotomy respectively. This could be due to the high effect of cold vibration on a cognitive area in the brain of a child rather than a stress ball that distracts the child away from the source of pain. **Sahiner et al., (2018)** were in the same line with these findings who studied a combination of two distraction methods in reducing injection's pain as vibration cold and found that it was more effective in reducing pain for children undergoing injection. **Yüksel et al., (2024**) who mentioned that stress ball reduces the pain level of patients in angiography was also in contrast with the present study.

Regarding behavioral distress during phlebotomy, it was observed that nearly half and a third of children had mild and moderate behavioral distress respectively during phlebotomy in the vibrating cold group. This may be due to decreased pain associated with decreased stress. **Redfern et al., (2018) & Susam et al., (2018)** were in support with this finding, who studies conducted on children revealed that vibrating cold application reduced anxiety during blood sampling, intravenous, and immunization injections.

As regards behavioral distress during phlebotomy in the stress ball group, it was observed that a third and less than half of them had moderate to severe behavioral distress respectively during phlebotomy. Stress ball affects also on pain relief and it reflects on stress. It was observed a reduction in anxiety levels among patients in the experimental group as mentioned by **Yüksel et al .,(2024) & Cirik et al ., (2023)** was also in contrast with the present study. Stress ball distraction was found to be effective in reducing pain, fear, and anxiety during phlebotomy as mentioned by **Gerçeker et al., (2024)** who were also on the same line with the present study.

It was clear that there were statistically positive correlations between the level of pain and level of behavioral distress for vibrating cold and stress ball groups in the current study. As decreasing of pain reflects on decreasing stress and anxiety of the child and vice versa. The current study finding was in agreement with **Michaelides et al., (2019)** who mentioned that, pain duration increases anxiety and they are linked to a higher perception of pain severity. Also**, EL-mahdy et al., (2023)** who mentioned that there was a positive correlation between the level of pain and the level of anxiety before, during, and after injections were on the same line.

Conclusion:

It can be concluded from the results of the current study that: vibrating cold application and stress ball may be used during phlebotomy and were effective in reducing pain and behavioral distress. A vibrating cold application was more effective in relieving pain and decreasing the level of behavioral distress than a stress ball.

Recommendations:

The following are suggested and recommended:

- Ongoing educational programs should be conducted for pediatric nurses about -the application of vibrating cold and stress ball to minimize associated pain &distress during phlebotomy.
- Assessment of pain and distress needs to be integrated into the usual assessment of children.

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