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Comparing the Effect of Two Methods of Distraction on the Pain Intensity Venipuncture in School-age Children: A Randomized Clinical Trial

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Abstract

Background

Children undergo painful procedures during care and treatment. This study aimed to determine the effect of distraction on the intensity of pain in children aged 6 to 12 years old.

Materials and Methods

This clinical trial was conducted on the school-age children, who referred to Imam Hossein Hospital, Iran, Heris city, East Azarbaijan province (Iran) in 2017. In total 48 patients were selected through convenience sampling technique and were randomly divided into three groups of 16 cases. In all three groups, pain was measured using the Oucher1 self-report scale, 3 minute before and after the venipuncture. One minute before venipuncture, in the "deep breathing with blowing paper whirligigs" groups after spinning the paper whirligigs and exhalation, in the "deep breathing" groups after exhalation, numbers were counted up to 10 spins or 10 breaths. In the control group, no intervention was performed. The data analysis was performed in the SPSS software (version 13.0).

Results: The results showed that "deep breathing with blowing paper whirligigs" (Mean ± standard deviation [SD]: 2.69±0.79) and "deep breathing" (Mean ± SD: 2.63±1.31) reported less pain intensity than the control group (Mean ± SD: 5.25±1.00), and the "deep breathing with blowing paper whirligigs" method had the least pain intensity. The results of ANOVA test showed that there was a significant difference among the groups in terms of pain intensity after intervention ($P \leq 0.001$).

Conclusion

The findings showed that both methods of distraction in this study (deep breathing with blowing paper whirligigs and deep breathing) can effectively decrease the venipuncture pain.

Key Words: Children, Distraction, Pain, Venipuncture.

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1- INTRODUCTION

Pain is a mental and reactive feeling, resulting from neural perception at various levels of the body, caused by harmful stimuli in the environment (1), which, if not controlled, causes numerous adverse effects on life and body systems, causing absence from school or even death of a child (2). Causes of acute pain can be the onset of a disease, traumatic injuries, or painful procedures for diagnosis, prevention, or treatment (3). Venous injections are one of the most important ways of administering the drug, while pain is an important adverse effect of intravenous injection that occurs when a needle or peripheral venous catheter is injected (4), so that most children consider such actions as the most stressful aspect of the disease, hospitalization and even an outpatient visit (5). Because this action is an invasion on the child's psychological and physical milieu and threats to them (6). According to the results of the research, venipuncture is one of the largest sources of pain in pediatric wards, of which children aged 6 to 12 years old report high levels of tension and pain (7).

Pain management methods include pharmaceutical and non-pharmaceutical treatments (8). In school-age children, due to the evolution of senses and procession of sensory information, measures should be employed to involve the child's five senses as much as possible (9). Distraction is the most commonly used method for short painful procedures (10). The basis for distraction is that, if the reticular structure in the brain stem receives sufficient and different sensory stimulation, it can selectively prevent and overlook the sensory transmission, such as pain (5). The results of the research on children's behavior during implementation of painful methods have shown that distraction had a moderate to high effect on children's adaptation (11). Various forms of active distraction, often used in clinical units, include interactive toys, controlled breathing and virtual games, like computer games (12). Deep, slow and regular breathing is one of the most suitable non-pharmaceutical methods that can be used for acute pain. There are several types of this technique, including blowing a pipe inside a glass of water, and counting numbers 2, 3, and 4 while inhalation and exhalation (13). Using regular breathing causes the child to deliberately distract her mind from pain, control pain and anxiety, and reduce feelings of pain and anxiety (14). Game therapy, as another form of distraction, can be practiced by various treatment team members, especially the nurse, and at any place even in the child's bed (15). Games in the hospital can have many uses; for example, provide a way of distracting the child in providing painful procedures (3).

Due to the complications of pain in children's development (anorexia, insomnia and nutritional problems), it is essential to control pain in pediatric hospitals. According to the results of the research, venipuncture is one of the most common sources of pain in pediatric wards and in children aged 6-12 years' old who report high levels of tension and pain. Distraction with deep breathing due to non-invasive, safety and simple technique can be used in children as a method of distraction from pain. In the study of Valizadeh et al. (16), Esmaeili et al. (17) regular breathing compared to music had a lesser effect on reducing the incidence of pain in children.

In this study, we combined the game with deep breathing to measure its effect on the intensity of pain in children. Games can also distract children from painful procedures and can play a very important role in introducing the child to the procedure. This study aimed to use two methods of active distraction ("deep breathing", and "deep breathing with blowing paper whirligigs") in order to

measure its effect on pain intensity venipuncture in school age children.

2- MATERIALS AND METHODS

2-1. Design

This study is a randomized clinical trial without blinding. This clinical trial was conducted on the school age children, who referred to Emergency department of Imam Hossein Hospital, Tabriz, Heris count (East Azarbaijan peovince, Iran) in 2017. The study diagram is represented in **Figure.1**.

2-2. Participants and setting

The sample size was calculated using the mean difference formula with 95% confidence interval (95% CI), 90% test power, and accuracy of 0.05, and according to the study by Sikorova et al. (18). The mean and standard deviation (SD) of pain intensity in the control and intervention groups were 2.36 ± 9.3 and 2.16 ± 6.87, respectively. After replacing the numbers in the sample size formula, 15 children were calculated in each group, and considering probability of 10% dropout of samples, 16 children were considered in each group (**Figure.1**). The sample size was calculated according to the following formula:

$$n = \frac{(z1 - \frac{\alpha}{2} + z1 - \beta)^2(sd1^2 + sd2^2)}{(x1 - x2)^2}$$

In total 48 patients were selected through convenience sampling technique and were randomly divided into three groups of 16 cases within May to June 2017. The participants were divided into two intervention groups ("deep breathing" and "deep breathing with blowing paper whirligigs"), and one control group. To do so, the researcher wrote "1", "2", and "C" phrases, representing the first (deep breathing with blowing paper whirligigs) and second (deep breathing) interventions and control group, respectively, on colored papers and kept them in a covered package. After introduction and with regard to the research ethics, the children were required to select a card according to which they were entered into the respective study groups. This continued until the completion of the groups. Eligibility criteria for participants including: aged 6-12, who were able to count from 1 to 10, the child and their parents were willing to cooperate with the study was included in to the study.

2-3. Instrument

The research tools consisted of the demographic form (age, gender, birth rating, history of hospitalization, venipuncture site), registration form for pain intensity and the form self-report scale of Oucher Pain for assessing pain (16). The Oucher is a poster-like instrument designed to help children provide self-reports of the intensity of their pain. The questionnaire was completed for the age group of 6 to 12 years old, which was completed by the researcher after written consent from the parents. The validity and reliability of the demographic questionnaire and registration form for pain intensity have been verified by ten by ten university professors. The Oucher scale is one of the most valid, oldest, and most widely used self-report scale for pain severity developed by Beyer in 1984 to assess the severity of pain in children aged 4-12 years old, which is a numerical scale that is like a horizontal ruler starting from zero on the left, progress in until 10 to the right; as the numbers increase, the intensity of the pain also increases, so that the number 0 shows no pain and 10indicates very severe pain (2). The pain severity questionnaire completed three minutes before and after venipuncture, was completed by the researcher after asking the children. Validity and reliability of the self-report scale of Oucher pain have been confirmed in various studies (16, 17, 19).

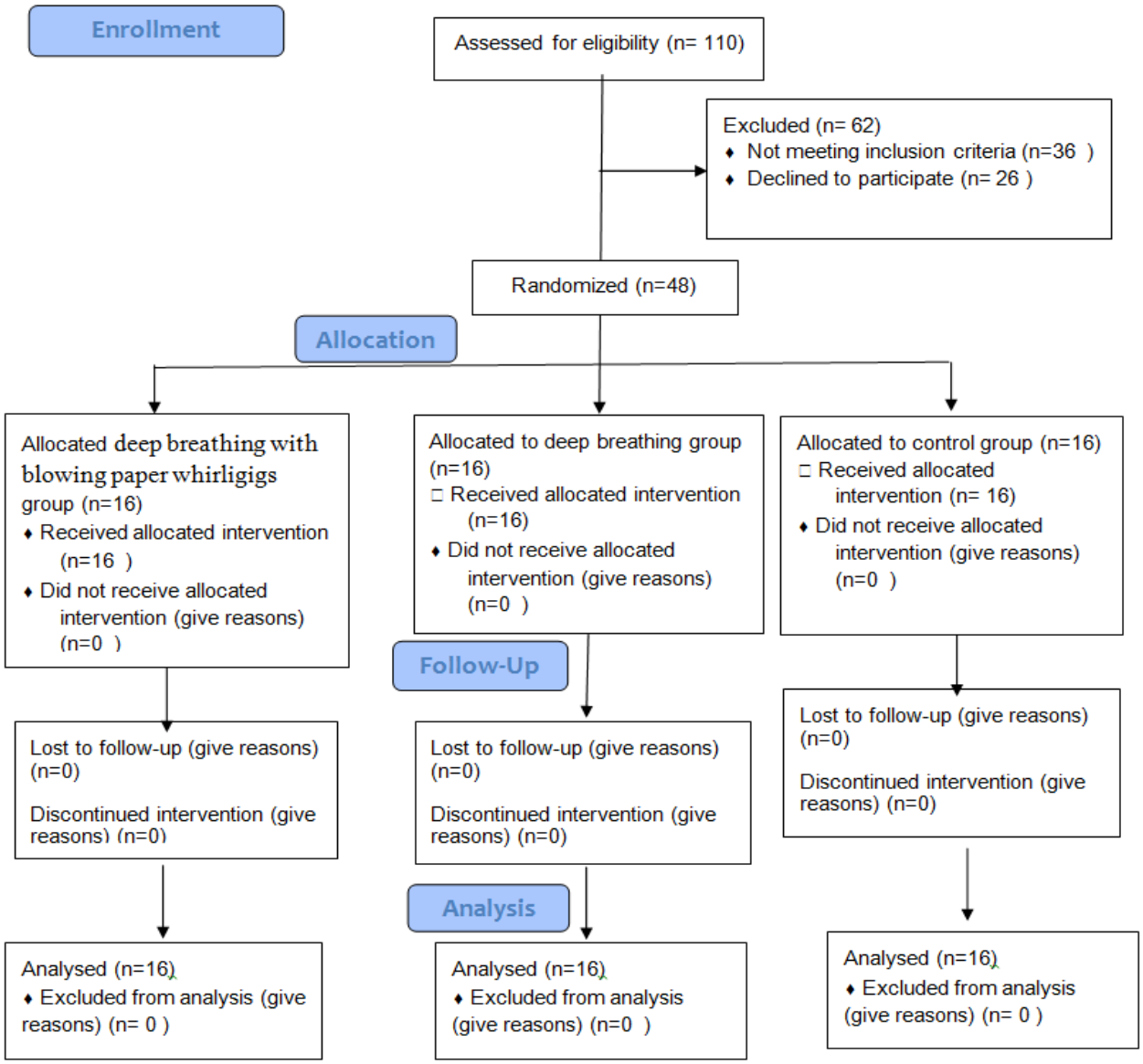

Fig1: Consort diagram.

2-4. Data Collection

In order to perform the intervention, in all three groups, after filling out consent form by parents, the venipuncture and pain measurement were performed in a private and specific room. Trained pediatric nurse perform venipuncture from hand or forearm veins. The pain was measured by the researcher. In each of the three groups, 3 minutes before venipuncture, the researcher asked the child about the intensity of pain, using Oucher self-report scale, instrument, and recorded the results in the questionnaire (16). The Oucher is a poster-like instrument designed to help children provide self-reports of the intensity of their pain. It can be used with children ages 3-12 years. Although it has not been tested with children who have special needs, it seems reasonable to suggest that it can be used with any child who functions at a cognitive level between 3-12 years who can understand its use (20). In intervention groups were distracted one minute before venipuncture (17). In group 1 (deep breathing with blowing paper whirligigs), the child had a deep nose inhalation and blew a whirligig

during exhalation, after spinning whirligig and exhalation, numbers were counted up to 10 spins (**Picture.1**). In group 2 (deep breathing), inhalation was by nose and exhalation by mouth, after exhalation, numbers were counted up to 10 breaths. The venipuncture was performed before the counting was completed. In the control group, no intervention was performed. In each of the three groups, 3 minutes after venipuncture, the researcher asked the child about the intensity of pain, using Oucher self-report scale, instrument, and recorded the results in the (16).

Fig.1: Deep breathing with blowing paper whirligigs.

2-5. Ethical considerations

In line with the ethical considerations, the research objectives were explained face-to-face to the mothers of the participants in their presence. Furthermore, they were informed about the possibility to withdraw from the study at any time without any effect on the venipuncture process. In addition, the researcher was available throughout the study and answered all the questions. The written informed consents were obtained from the mothers prior to the study. The research was confirmed by the Regional Medical Sciences Research Ethics Committee of Tabriz University of Medical Sciences (ID- code: IR.TBZMED.REC.1396.171).

2-6. Statistical analysis

The data analysis was performed in the SPSS software version 13.0, using the descriptive statistics (mean and standard deviation), paired t- test (for intra-group comparison), and one-way ANOVA (to evaluate the difference between the mean scores of the participants). P-value less than 0.05 were statistical significant.

3- RESULTS

The purpose of this study was to compare pain intensity changes in three groups ("deep breathing with blowing paper whirligigs"**,** "deep breathing" and control). The demographic variables were shown in **Table.1**. According to this table, the frequency distribution and percentage of other baseline characteristics of children according to the three groups and the results showed no statistically significant difference among the three groups of blowing paper whirligigs and deep breathing, deep breathing and control group in demographic variables such as age, gender, birth rank, history of admission and venipuncture site (P>0.05). In other words, three groups were homogeneous in terms of these variables. The results of the normal test related to the pain intensity before and after the intervention according to the groups (control and experiment). According to the Kolmogorov-Smirnov test (P>0.05), the distribution of data is normal (**Table.2**).

The results of paired t-test for within-group comparisons in deep breathing with blowing paper whirligigs group ($p \leq 0.001$), and control ($p \leq 0.001$) was a significant difference between the two groups before and after the intervention, but this difference was not significant for the "deep breathing" group ($p \leq 0.14$). The results of ANOVA test showed that there was no significant difference between the three groups in terms of pain intensity changes before the intervention (P = 0.29), but there was a significant difference between the three groups after the intervention (P<0.001) (**Table.3**). In addition, the post-hoc Tukey test demonstrated that the

control group had a significant difference with the distraction techniques of "deep breathing with blowing paper whirligigs" (P=0.001), and "deep breathing" (P=0.001). However, no significant difference was observed between the two intervention groups in this regard (P=0.98). The results showed that the "deep breathing with blowing paper whirligigs" (Mean ± SD: 2.69±0.79), and "deep breathing" (Mean ± SD: 2.63±1.31) reported less pain intensity than the control group (Mean ± SD: 5.25±1.00); and the "deep breathing with blowing paper whirligigs" method had the least pain intensity (P<0.05).

Table-1: Demographic characteristics of children in control and interventional groups

Variables	Categories	Deep breathing with blowing paper whirligigs group (n=16)	Deep breathing group (n=16)	Control (n=16)	P-value
Gender	Boy	8 (50)	7(43.7)	10 (62.5)	0.55
	Girl	8 (50)	9 (56.2)	6 (37.5)	
Birth rating	First Child	9 (56.2)	12 (75)	9 (56.2)	0.2
	Second Child	5 (31.2)	0	4 (25)	
	Third child and above	2 (12.5)	4 (25)	3 (18.7)	
History of hospitalization	Yes	2 (12.5)	2 (12.5)	3 (20)	0.79
	No	14 (87.5)	14 (87.5)	12 (80)	
Venipuncture site	Behind the left hand	2 (12.5)	2 (12.5)	1 (6.3)	0.52
	Right forearm	12 (75)	8 (50)	10 (62.5)	
	Left forearm	2 (12.5)	6 (37.5)	5 (31.3)	
Age		Mean (SD)	Mean (SD)	Mean (SD)	P-value
		8.31 (1.99)	9.25 (2.20)	8.38 (1.96)	0.36

Table-2: The results of the normal test related to the pain intensity before and after the intervention according to the groups (control and experiment)

			Pre-test		Post-test	
Variables	Groups	Number	K-S statistics	P-value	K-S statistics	P-value
Intensity of pain	Deep breathing with blowing paper whirligigs	16	0.214	0.051	0.307	0.269
	Deep breathing)	16	0.195	0.107	0.168	0.200
	Control	16	0.205	0.070	0.214	0.050

Table-3: The comparison of changes of pain intensity before and after intervention

			Pretes		Post-test	
Variables	Groups	Number	K-S statistics	P-value	K-S statistics	P-value
Intensity of pain	deep breathing with blowing paper whirligigs	16	0.214	0.051	0.307	0.269
	Deep breathing)	16	0.195	0.107	0.168	0.200
	Control	16	0.205	0.070	0.214	0.050

4- DISCUSSION

In response to the aim of the study, comparing pain intensity changes in the three groups before and after the intervention, the results of this study showed that the variation in pain intensity due to venipuncture was different in the 3 groups before and after the intervention. The results showed that "deep breathing with blowing paper whirligigs" and "deep breathing" reported less pain intensity than the control group and the "deep breathing with blowing paper whirligigs" method

had the least pain intensity. In this study, 52% of the participants were boys and 47% were girls. The participants in the "deep breathing with blowing paper whirligigs" group were 50% girl and 50% boy, so the gender variable in this study was not effective in reporting the severity of pain. The mean age of participants was 8.31, 9.25, and 8.38 in the "deep breathing with blowing paper whirligigs", "deep breathing", and control groups, respectively. Considering that the "deep breathing with blowing paper whirligigs" group the mean age of children was lower than the other two groups (Mean: 8.31± 1.99), it can be concluded that in young children, the treatment game gives more distraction than pain. Distractions are an effective technique for reducing pain.

The basis for distraction is that, if the reticular structure in the brain stem receives sufficient and different sensory stimulation, it can selectively prevent and overlook the sensory transmission, such as pain (5). Using regular breathing makes the child effortlessly distracting his mind and it creates feelings of control over pain and anxiety and reduces pain and anxiety behaviors (14). Deep breathing will keep the child focused on doing it and reporting less pain. The results of this study showed that deep breathing has been effective in reducing the pain of venipuncture in children. Deep breathing will cause more endorphin secretion which plays the role of natural relieve pain in the body (21). Playing in the hospital provides a way to distract the child from the painful procedure (3), and the cheerfulness of the patient will be possible with very little facilities (17). If deep breathing is carried out with a blowing paper whirligigs**,** when the children see them blowing will cause the whirligigs to spin it was attractive to them and tend to repeat it**.** As the results of this study showed that the distraction with "deep breathing with blowing paper whirligigs" technique are more effective than deep breathing on the pain intensity venipuncture in school-age children. Esmaeili et al., and Valizadeh et al. in two separate studies, the effect of two methods of deep breathing and music on the pain severity of intravenous cannulation during blood transfusion in school-age children was compared. The results of their study showed that music and deep breathing significantly reduced the pain of children and music is more effective than deep breathing (16, 17). Based on the results of these two studies (Esmaeili et al., Valizadeh et al), we combined deep breathing with a blowing paper whirligigs to measure its effect on the severity of venipuncture pain, which showed that deep breathing with blowing paper whirligigs was more effective than deep breathing. Making bubbles was more effective than control group in two studies, but there was no significant difference between cream (Eutechtic mixture of local anesthetics [EMLA]), and regular breathing (5, 6).

Razaghi et al. studied two methods of bubble and touch in reducing the severity of venipuncture pain in children aged 5-10 years old, results showed that both methods were effective in reducing pain (22). The results of the Robabi et al.'s study showed that two distraction methods of inflating balloon and watching cartoons could effectively decrease the pain induced by Diphtheria, tetanus, and pertussis (DPT) vaccine school-age children (23). The results of the Aydin et al.'s study showed that three different methods of pressing the ball, blowing the balloon and the card are effective in reducing the pain in school-age children (24). Blowing paper whirligigs, making bubbles and blowing the balloon is a kind of distraction from the game that requires deep breathing, which have been effective in reducing children's pain in the studies. Paper whirligigs that can be used to make it from paper, tongue depressor and pins which can be used to make it, compared to the previous two

methods, it is economical and is attractive for the school-age child. Because the child himself can also help in making it and this partnership improves the relationship between the child and the nurse. Distraction is the most commonly used method for painful procedures that lasts for a short time. In this study, playing the game before venipuncture reduces the intensity of the child's pain. Distraction by squeezing soft and small ball on children's behavioral responses to pain during intra venous (IV) catheter insertion in children aged 4-6 years, the results showed that distraction, behavioral responses, and pediatric pain were reduced (25).

Using the light and sound producing toys could be used as an effective distraction technique to reduce the vaccination pain (26). Moving toys within the period of before to after injection, reduced vaccination pain in the newborns (27). Use of music reduces the incidence of school-age children (28). Animated distraction distracts/diverts the child's attention from pain and results in better cooperation of child during venipuncture (29). The other studies showed that distraction does not have much effect on pain relief. By studying 99 children aged 12-20 months, Hill grove acknowledged that the distraction created by the toys does not reduce the pain caused by vaccine injection (30). In another study, Pourmovahed et al. compared the effect of two music interventions and EMLA cream on the severity of pain associated with intravenous injection and concluded that there was no significant difference between the music group and the control group, but there was a significant difference in EMLA group (31). In this regard, it can be said that with increasing age and intellectual maturity, fear and anxiety of children are reduced during sedation and show more adaptive behaviors. If the distraction technique is carefully selected and implemented, it will be effective in reducing pain and all painful procedures (32). According to research results, venipuncture is one of the largest sources of pain in pediatric wards, which children aged 6 to 12 report high levels of tension and pain (7). Therefore, considering the economics of the method of distraction with deep breathing or blowing paper whirligigs, and nursing autonomy in its application, if this distraction technique is implemented, it will be effective in reducing the pain of school-age children and it will improve the communication between the nurse and the child.

4-1. Limitations of the study

Each study has its own limitations, this study was conducted in the age group of 6-12 years old and only in the emergency department of the hospital. It is suggested that in the future, this study should be done using different methods of distraction, in different age groups and in different wards of the hospital in order to evaluate the effects of different methods.

5- CONCLUSION

According to the findings of this study, "deep breathing with blowing paper whirligigs" and "deep breathing" methods can be effectively decreasing the pain induced by venipuncture. Therefore, the use of these techniques is recommended to manage the pain in children since they are inexpensive and simple.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENTS

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