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Original Article

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The Effect of Audio-Visual Distraction on Catheterization Pain among School-Age Children

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Abstract

Background: Catheterization is the most common cause of pain and distress in children, which causes physical and psychological dysfunctions and disrupts the treatment. Therefore, the control of this type of pain should be considered as a priority for nursing care. The audio-visual distraction can be used to reduce the intensity of pain.

Aim: The purpose of this study was to determine the effect of audio-visual distraction on catheterization pain among school-age children.

Methods: This randomized clinical trial included 64 school-age children assigned into intervention and control group in Qods Hospital during 2016. Oucher face pain intensity scale was utilized to evaluate the intensity level of pain. Catheterization duration was also recorded in this study. Data were analysed in SPSS software (Version.18) through descriptive statistics, t-test, Mann-Whitney U test, and Spearman correlation analyses.

Results: The mean ages of the intervention and control groups were 7.8±1.4 and 7.7±1.6, respectively. The results of the Mann-Whitney U test showed that the mean pain intensity was lower in the intervention group after using the three-dimensional glasses (P=0.01). Spearman correlation test results indicated that there were no significant differences between different ethnicities (P=0.37) and birth ratings (r=-0.061, P-value=0.63) in terms of mean pain intensity.

Implications for Practice: According to the results, the use of distraction methods could reduce the pain. In addition, they facilitated medical procedures. The role of variables, such as age, gender, and duration of catheterization should be considered in pain intensity.

Keywords: Audio-visual distraction, Catheterization, Pain, School-age children

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Introduction

The pain caused by the therapeutic procedures is an unpleasant physical and emotional experience that can be associated with actual or potential tissue damage (1-5). In addition, the frequent experience of it can have adverse effects on life, such as changes in response to stress and giving rise to vulnerability in cases of physical and psychological problems, neurodevelopmental disorders, learning disabilities, and behavioral problems in children (6, 7). Immunization and catheterization are the most common medical procedures that cause pain in children (8, 9). Many children experience fear prior to the beginning of medical treatment, which in turn can exacerbate pain perception (10, 11). The effects of pain, fear, and anxiety can persist for a long time and delay the treatment or avoidance of care. Therefore, the memory of a painful experience may affect children's compatibility in similar cases in the future (12, 13). Nurses should take the essential steps to reduce the emotional and physical harm of children in the face of painful treatments (6, 13, 14). The first priority in pain management is the use of non-pharmacological methods to reduce it (15). Moreover, easy to use treatment methods which cause no fear or disturbance in the treatment procedure should be selected by the care team staffs (8, 16, 17).

Non-pharmacological methods, especially for children who are frequently treated, are applied as distractors together with the use of five senses as a mean to reduce pain in children. This can be achieved using a toy, kaleidoscopes, bubble-blowing machines, distraction cards, music, handheld video games, and 3-D virtual reality glasses, which can be as effective as chemotherapy and even better in some cases (10, 14, 16-18). Considering the growth and development of school-age children, distraction with 3D glasses of virtual reality with the use of five senses can control the pain and distress (17). Therefore, it is effective for school-age children to watch appropriate cartoons. This type of distraction provides a comfortable condition for the patients (19) and it increases the patient's desire to follow the treatment due to the creation of a positive memory (20).

Despite scientific evidence to support the necessity of using appropriate methods to control pain, many medical centres do not use any pain interventions. Therefore, the present study aimed at determining the impact of audio-visual distraction on reducing pain induced by catheterization among school-age children.

Methods

This randomized clinical trial study was conducted at Qods Hospital. The sample size was calculated based on a previous study (21) using the mean comparison formula, the confidence coefficient of 95%, and the test power of 80%. The required admission and permission were taken from university authorities and the hospital, respectively. Subsequently, 64 participants were randomly selected from all 6- to 12-year-old children who referred to the emergency department and surgical ward. The sampling was randomly performed within 10 days. Based on the inclusion criteria, the participants were selected purposefully each day and then randomly assigned into intervention and control groups using a coin-flip (22). Furthermore, the participants were equally selected from the emergency department and the surgical ward. After the sampling was completed, the intervention was carried out. However, catheterization was done by an expert nurse. During the study, two subjects from the control group were not willing to continue their cooperation and were excluded from the research. The inclusion criterion was Iranian children within the age range of 6-12 years who required catheterization for drug injection. On the other hand, children with 1) a history of hospitalization and catheterization, 2) the experience of using painkillers prior to catheterization, 3) refractive vision problems (astigmatism, contact lens, and glasses), 4) diabetes and peripheral nerve disorder conditions, 5) agitation, toxicity, and unconsciousness, and 6) other special conditions (mental retardation) were excluded from the study. Moreover, the exclusion criteria included lack of consent of parents and children to continue cooperation.

The evaluation tool used in this study consisted of two parts. The first part was a questionnaire related to demographic information, including gender, age, the reason for admission, ethnicity, birth rating, and the duration of catheterization. The other part was the Oucher face pain scale designed by Beyer et al. which was also used in a domestic study (21, 23). This scale consists of six faces of a child indicating different intensities of pain which scored within the range of 1 (no pain) to 6 (worst possible pain). The validity and reliability of this instrument was also confirmed in this study (24). In addition, one of the researcher measured and recorded each of the abovementioned variables.

The inter-rater coefficient method was used to assess the reliability of the tool. Two examiners used this instrument as a measurement scale for 10 children simultaneously and the correlation coefficient (Kappa coefficient) was estimated at 0.8 between their observations. A Tom and Jerry-labelled CD product type (comedy) and target audience (children and adolescents) were employed to validate the intervention.

An experienced nurse with sufficient catheterization skills in the paediatric population was employed in the injecting room to perform catheterization. In order to familiarize the children, they were asked to watch Tom and Jerry comedy animation CD played through 3-D glasses. The intervention began 2 min prior to the onset of catheterization and continued until the end of the procedure. The duration of catheterization was calculated and recorded in the questionnaire using a fixed stopwatch, started from the time of needle insertion to the end of fixing the angiocath in place by the first researcher.

Blue 22-gauge angiocatheters (0.9/25mm) were placed into the right forearm veins of all participants. Ten minutes after catheterization, when the child was calm (21), the pain experienced during catheterization was assessed using the Oucher face pain scale. The children were asked to denote the specific picture that rated their pain at the point where the needle had been inserted into the vein. The control group was subjected to all of the above steps, excluding playing the comedy CD. For the control group, the routine interventions were performed and they watched the cartoon after catheterization.

All the participants were informed of the confidentiality of the data and they were all volunteers to participate in the study without any physical and financial harm. The research protocol was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences, Tehran, Iran (IR.SBMU2.REC.1394.2). The obtained data were analysed in SPSS software (Version.18) through descriptive statistics, t-test, Mann-Whitney U test, and Spearman correlation analyses. P-value less than 0.05 was considered statistically significant.

Results

The two groups were identical in terms of individual characteristics in this study. The mean ages of intervention and control groups were 7.8±1.4 and 7.7±1.6, respectively. There was no significant difference between the two groups regarding the results of independent t-test (P=0.26). Table 1 presents the frequency distribution of demographic characteristics of the participants. Moreover, data distribution was normal according to the results obtained from the Kolmogorov test.

Table1. Distribution of demographic characteristics of children participating in research

Items		Intervention group n (%)	Control group n (%)	P-value Chi-square
Gender	Male	14 (43.8)	18 (60)	0.20
	Female	18 (56.3)	12 (40)	
Ethnicity	Tork	13 (40.6)	12 (40)	0.60
	Fars	11 (34.4)	9 (30)	
	Lor	6 (18.8)	4 (13.3)	
	Kord	2 (6.3)	5 (16.7)	
Birth rating	First	5 (15.6)	5 (16.7)	0.44
	Second	14 (43.8)	13 (43.3)	
	Third	6 (18.8)	9 (30)	
	Fourth	4 (12.5)	3 (10)	

Regarding the purpose of this study, the mean values of pain intensity in the intervention and control groups were 26.4±1.3 and 36.8±1.1, respectively. According to the Mann-Whitney U test, the results indicate that children in the intervention group reported significantly less pain than the control group (P=0.01, Table 2).

Table2. Comparison of mean pain intensity between the intervention and control groups

Group	N	Mean pain intensity
Intervention	32	26.4±1.3
Control	30	36.8±1.1
Total		62
P-value		0.01

Mann-Whitney U Test

The mean values of pain intensity in males and females were 35.8±0.9 and 26.8±1.1, respectively, which indicates an association between gender and pain. Additionally, males showed greater levels of pain intensity (P=0.04).

Moreover, the mean values of pain intensity regarding different ethnicities of Tork, Fars, Lor, and Kord were 28.4±1.4, 37±1.7, 28.4±1.6, and 31±1.5, respectively. In addition, there were no significant differences among them based on the results of the Kruskal-Wallis test (P=0.37). Furthermore, Spearman correlation test results showed no significant difference in mean pain intensity regarding birth ratings (r=-0.061, P=0.639).

The results of this study indicated that there was an inverse and significant relationship between mean pain intensity and the age of participants included in this study. However, a positive and significant association was observed between mean pain intensity and the duration of catheterization (Table 3).

Table3. Evaluation of the correlation between mean pain intensity and, age, birth rating, as well as the duration of catheterization among children participating in the study

		Age	Birth rating	Duration of catheterization
Mean pain intensity	Spearman correlation			
	P-value	0.001>	0.63	0.03
	r	0.673-	0.061-	0.263

The mean duration of catheterization was not different between the groups based on the independent t-test results (P=0.01).

Discussion

Audio-visual distraction significantly decreased pain severity in this study. The results showed that mean pain intensity was higher among males and there was a significant relationship between gender and the intensity of pain. Blount et al. (2003) assertd that factors, such as gender, and endurance could influence pain intensity. Accordingly, the pain threshold is higher among females than males within the same age group. Therefore, this can justify the results of the present study (17). Pain tolerance relies on the emotional and cognitive factors, and the maximum pain that a person can tolerate varies from person to person.

Moreover, there was no statistically significant difference between different ethnicities and birth ratings in terms of mean pain intensity. Regarding the number of participants and the sampling method, there are some inconsistencies between the results of this study and those of other studies. However, it seems that these differences in the findings resulted from cultural, religious, and national dissimilarities in the research communities. Nevertheless, the results obtained from a study conducted by Vosoghi et al. (2010) were consistent with the results of this study (21).

In a study conducted on the introduction of factors associated with pain induced by catheterization, an association was observed between pain severity and other variables, including gender, genetics, temperament, and ethnicity (25). In the present study, there was an inverse and significant relationship between mean pain intensity and the age of the participants. Accordingly, younger children experienced more level of pain. Furthermore, the results of the study by Blount et al. (2003) indicated that younger children endured more stress and higher levels of pain (17). This can be due to the inadequacy of environmental interventions to enhance patients' adjustment. For instance, the participants' field of view was reduced using plastic pads; however, it was not entirely possible in younger children.

With regard to the specific aim of this study, the results obtained from the comparison of mean pain intensity within both groups showed that the intervention group reported less pain, compared to the control group, for whom catheterization was performed using only the standard procedure. Law et al. (2010) conducted a study on two intervention groups, namely interactive (video game), and passive (video game plus music as a distraction), as well as a control group. According to the results, pain tolerance levels were longer in both distraction groups, compared to the control group. Therefore, it appears that the experience of pain decreases while applying the distraction and involving the senses (26). These results are in line with the findings in the present study in which the amount of pain has been reduced by distraction and the involvement of participants' senses.

The findings obtained from other studies were also consistent with the results of the present study and showed that the threshold of pain increased with virtual reality distraction leading to the improvement of pain tolerance (19, 27-29). In fact, when a child involves in an active distraction task, the pain threshold and the amount of pain tolerance are increased; therefore, the patient will tolerate less distress (8, 30). In another study, distraction intervention reduced the intensity of pain in children which was in line with the results of this study (31). Pain and distress have side effects and can lead to severe reactions, such as increasing the response to pain and avoiding the continuation of aggressive procedures due to fear.

On the other hand, a study was carried out to evaluate the effect of audiovisual distraction on children's anxiety (32), cortisol levels, and heart rate before and after the intervention. According to the results, there was no significant difference between the effect of virtual reality and the abovementioned variables. However, the authors have pointed out that the inappropriate size of glasses affected the results in their study.

In the present study, the glasses sizes were appropriate for children of the school age, and it was possible to reduce the field of view using the plastic pads. However, in a study performed by Jafarzadeh et al. (2011), there was no possibility to reduce the field of view which caused inconsistencies between their findings and the results of this study (32). In addition, there was no difference between both groups regarding the duration of catheterization.

In a study performed by Wang et al., the results showed that the duration of catheterization was longer for the control group than that in the intervention group. This can be argued that the difference in duration of catheterization is associated with a decrease in pain and the tolerance level of the intervention group. As a result, a nurse can perform catheterization in a shorter time when the patients have higher levels of pain tolerance (33). However, due to the small sample size, there are potential concerns about generalizing the results for this study.

There was a positive and significant correlation between pain intensity and the duration of catheterization. Susan and Gerik (2005) state that children try to stop interventions because they are afraid of pain. As a result, the child resists the procedures following an experience of pain, thereby increasing the duration of the catheterization and causing more pain and stress (34). On the other hand, the effects of pain, fear, and anxiety can be problematic and delay the treatment (13). Therefore, in order to reduce the pain caused by aggressive procedures which leads to distress, the interventions to prevent and reduce pain are recommended in this study (35). Although this study paved the way for the use of audio-visual distraction on catheterization pain, it suffers from some limitations, such as the lack of control to remove the ambient noise. Although the noise could be minimized with 3-D glasses as far as possible, it was not possible to eliminate it completely. In addition, the small sample size can be considered as another limitation in this study.

Implications for Practice

The pain induced by medical procedures may lead to short- and long-term physical and psychological side effects. This has rendered the ways for controlling pain in children which is regarded as one of the biggest challenges facing health care teams. Pain causes more fear and tension in children and as a result, medical staff faces additional resistance from children leading to disturbances within care work.

Based on our results, it appears that some demographic and clinical variables, such as age, gender, and the duration of catheterization affect the experienced pain levels that are associated with painful medical procedures. Therefore, the important role of these factors should be considered when performing nursing interventions.

Furthermore, based on the findings of the present study, there was a significant difference between the both groups regarding the mean pain intensity. According to the results, the mean pain intensity was higher in the control group, compared to the intervention group. Therefore, it appears that the intervention caused a distraction in children during catheterization and was effective in reducing the reported pain. In general, it can be concluded that audio-visual distraction can reduce the pain induced by catheterization in children. Accordingly, in addition to facilitating therapeutic procedures, the use of distraction methods can reduce the incidence of pain and in turn, improve the general health of the individual.

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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