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Effectiveness of Cartoon Watching for Distraction in Reducing Pain during Venipuncture among Preschool Children: A Randomized Control Trial

Muthu Balamurali [1], **Manivelu Sankaranathan Shrimathy** [1], **Krishnaswami Devimeenakshi** [1*]

1. Department of pediatrics, Kilpauk medical college, India.

*Corresponding Author: Dr. Krishnaswami Devimeenakshi;

Address: Department of Pediatrics, Government Kilpauk Medical college, Poonamalle high road, Kilpauk, Chennai-600010, Tamil nadu, India.

Tel: +91 4428364951 E-mail: drdevi_1804@yahoo.in

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ABSTRACT

Background and Objective: Venipuncture is the most common painful procedure experienced by children during hospitalization. The use of distraction techniques to help the child cope with the pain plays an important role in improving treatment outcomes and patient satisfaction. This study assessed the effectiveness of a cartoon to reduce pain during venipuncture in pre-school children admitted to the pediatric ward.

Methods: The study was an open-label, randomized, controlled trial conducted from September 2022 to November 2022 in the pediatric department of a Medical College Hospital in Chennai, Tamil Nadu, India. 3-5-year-old pre-school children admitted to the pediatric ward who underwent venipuncture were enrolled in the present study. The children in the intervention group were shown a cartoon video five minutes before and during the venipuncture, while the control group was not shown the video. The Pain Rating Scale (Wong Baker) was used for the children. The mean pain score in the intervention and control groups was compared.

Findings: Of the 72 preschool children recruited, 36 were in the intervention group and 36 in the control group. The mean (SD) pain score was significantly lower in the experimental group shown the cartoon video at 3.22(0.49) than the mean (SD) of the control group at 3.67(0.54) ($p<0.001$), confirming statistical significance. It was observed that the scores for severe pain were lower in the intervention group than in the control group.

Conclusion: Watching cartoons is an effective distraction that decreases pain during venipuncture in pre-school children.

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Introduction

Medical interventions done on hospitalized children cause not only pain but also fear and anxiety. Pain related to invasive procedures carried out in hospitals has an impact on the child not only during the present stay in the hospital, but also on the child's response to medical interventions that are carried out in the future [1].

Venipuncture is the most common painful procedure performed on children during hospitalization [1]. Though procedures like venipuncture are commonly done in hospitals, measures are not always taken to minimise pain and the emotional discomfort of the child [2]. The majority of preschool children experience considerable discomfort with procedures like venipuncture [3, 4]. It is the duty of the health workers to resort to measures to reduce the pain and discomfort of children under their care. Use of drugs like analgesics and sedatives is not appropriate for minor techniques like venipuncture [5].

The use of distraction techniques to help the child cope with pain plays an important role in improving the outcome of treatment and patient satisfaction. There are a number of distraction techniques that are useful to distract the child's focus away from the painful stimuli, which help to minimize fear, discomfort, and apprehension associated with medical interventions that cause pain [3]. Among the non-pharmacological distraction techniques used, it has been found that audiovisual tools are among the most effective [3]. Cartoon videos are effective attention-diverting strategies that are easy to administer and a cost-effective adjunct to combat pain during hospitalization of children [4].

The purpose of this study was to find out the impact of cartoons in minimizing pain caused by venipuncture among pre-school children admitted to the pediatric ward.

Methods

Study design and participant

This open-label randomized controlled trial study was conducted in the Pediatric ward of a Medical College hospital in Chennai, Tamil Nadu, Southern India, from September to November 2022. Pre-school children who were 3-5 years of age and were admitted to the pediatric ward and underwent venipuncture for blood sample collection were included in the study. Children with cognitive disability, abnormal behavior, hearing impairment, and not accompanied by their mothers were not included in the study. The basic sociodemographic data were collected by the pediatric resident on duty at the time of admission to the pediatric ward.

Sample size

Calculation of study sample size was done from a previous study [6], which reported a mean±standard deviation pain score in the experimental group being 5.45 ± 1.7 and control group 7.9±1.4 with an α error of 1% and β error of 5% with an allocation ratio of 1:1. Sample size was estimated to be 36 for each group.

Random numbers were generated by a computer with a block size of 6. It was generated by a person other than the principal investigator. Serially numbered opaque sealed envelopes were used for allocation concealment. All preschool children included in the study (both intervention and control groups) were allowed to be comforted by their mothers at the time of venipuncture.

Intervention

All the children in the intervention group were shown the same cartoon video (https://youtu.be/OTNUGIFueoQ?si=XiSqecxo) five minutes before and at the time of venipuncture. The children who were in the control group were not shown the video. Venipuncture was performed by the duty nurse in the pediatric ward. As the study was conducted in a Medical college hospital, all the nurses who worked in the pediatric ward had experience in performing procedures on children. However, no standard training was offered as part of the study. The venipuncture procedure was done as per the guidelines in the standard treatment protocol of the Institution. Pain rating scale (Wong Baker) was used in all the children to assess the degree of pain based on the facial expressions [7]. This included pain scores of 0 to 10. The scoring was done as no pain, mild, moderate, and severe. Score 0 - no hurt, scores 1-3 - hurts a little bit, scores 4-6 – hurts a little

more or even more, and scores 7-10 - hurts a whole lot or worse. The pain rating scale was administered by the principal investigator for all the children enrolled in the study. The different categories of pain and the mean pain score in the intervention and control groups were compared (Fig. 1).

Statistical Analysis

Analysis of data was done using SPSS 24. The outcome variable, namely pain score, was expressed in mean and standard deviation. Comparison of the mean pain score in both groups was performed using the Student "t" test. The different intensity of pain was compared by using the chi-square test, and a p-value <0.05 was considered statistically significant.

Results

Totally, 72 preschool children were recruited in the study, which included 36 in the intervention group and 36 in the control group. The mean age of the participants was 3.6±1.21 years. The majority of the children (33.3%) among the study population were five years of age. 55.6 % of participants were female, and 58.5% of the children did not have previous experience with venipuncture. The mean (SD) value of pain score among the participants was 3.4 (0.6). Comparison of the mean (SD) value of pain score among the two groups revealed that it was significantly lower in the intervention group, 3.22(0.49), who were shown the cartoon video, compared to the control group, 3.67(0.54).

It was observed in the pain scores that 50% of children had moderate pain and 47.2% had severe pain, while mild pain was found in only 2.8% of the study participants. It was observed that in the intervention group, the severe pain scores were lower than in the control group. In the intervention group, 72.22% of children had moderate pain. In the control group majority of them (69.44%) had severe pain, and only 27.78% of children had moderate pain. The number of children with mild pain was comparable in both groups.

Table 1. Pain scores between the intervention and control groups

Group	Number	Mean (SD) pain score	Standard error mean	P-value	95% confidence interval
Intervention	36	3.22(0.49)	0.081	<0.001	(-0.69 to -0.21)
Control	36	3.67(0.54)	0.089		

Table 2. Degree of pain scores between the intervention and control groups

Group	Mild pain	Moderate pain	Severe pain
Intervention	1(2.78)	26(72.22)	9(25)
Control	1(2.78)	10(27.78)	25(69.44)

Discussion

The present study evaluated the effectiveness of watching cartoons in pain reduction caused by venipuncture done on pre-school children admitted to the pediatric ward. The present study observed that watching a cartoon video had influenced pain perception and had significantly reduced pain among preschool children. It was also observed that the severity of pain perception was reduced in the intervention group, with more children experiencing moderate pain, while in the control group majority of the children had severe pain.

The present study indicated that the mean (SD) pain score among the children in the intervention group who were shown the cartoon video was significantly lower than the mean scores among children in the control group. Similar observations have been made by Inan G [8]. Phogat et al. observed that animated cartoon is a useful method to decrease pain among children who had venipuncture, and it may be necessary to manage the changes in behavior that occur in children who are subjected to procedures that are invasive [9]. Observations similar to the present study have been made, highlighting the usefulness of animated cartoon videos to minimize pain [4]. Methods like cartoon viewing can be a useful non-drug method to decrease fear and apprehension caused by intravenous treatments, and it may be tried

in the inpatient services to perform interventions that are difficult to perform due to fear of children [3]. The benefits of watching cartoon videos include distracting attention from the pain experienced by the child, leading to a reduction of fear and anxiety, so that children are able to undergo invasive procedures with a calm mind, which can minimize trauma [10].

Methods can be employed to divert the attention of children away from the procedure, like venipuncture. This may lead to the prevention of transmission of pain impulses to the brain, and as a result, pain perception is blunted [11]. Studies have shown that the mean pain scores were significantly different between patients who had venipuncture with audiovisual distraction (2.53±1.76) compared to those undergoing the procedure without distraction (5.22±2.53). In the intervention group with distractors, the mean cooperation level was 0.38 (SD=0.63) while it was 0.20 (SD=0.54) in the group without distractors [12]. Wohlheiter KA et al. compared interactive distraction with passive distraction and observed that preschool children were found to benefited from interactive distraction techniques, provided the activity used for distraction is appropriate to the developmental age of the child [13].

Gerards et al. evaluated the effect of virtual reality distraction videos on anxiety and pain during procedures done in the pediatric surgery ward and observed that pain was less not only during the procedure but also after completion. It was also found that the duration of the procedure was reduced significantly in the intervention group [14].

Neuroimaging studies have shown the effect of distraction techniques on the processing of pain, and changes have been noted in areas associated with pain processing, with decreased activation in the thalamus, somatosensory cortices, insula, and anterior cingulate cortex, while increased activation was observed in grey matter surrounding the aqueduct of Sylvius and posterior thalamus [15].

The present study found that in the intervention group, the severe pain scores were lower than in the control group (25 % vs. 69.44%). A higher proportion of children in the intervention group had moderate pain (72.22%) while in the control group majority of them had severe pain (69.44%). Other studies have made similar observations. Comparing the degree of pain in the intervention and control group, it was observed by Devi CP that the majority of preschoolers in the intervention group (56.25%) had moderate pain, whereas in the non-intervention group majority of preschoolers (87.5%) had severe pain and only 12.5% had moderate pain [16]. Similar findings were recorded by Safiya UK et al., who found that mild pain was observed in more than two-thirds of children in the study group, moderate pain was seen in one-third of children, and none of the children in the study group had severe pain. However, it was found that 60 % had moderate pain and 40 % had severe pain in the non-study group [2]. Similar findings were observed by Divya in their study on animation distraction during venipuncture, where severe pain was found in 75% of the control group, whereas in the intervention group, severe pain was not observed. Also, a small number of children (5%) in the intervention group did not experience pain when venipuncture was performed [17]. Maharjan S et al. also found that the majority of the children (56.7%) in the experimental group showed an animated cartoon had moderate pain, while 43.3% had severe pain, while all children in the control group had severe pain, which was similar to our observations [18].

A randomized control trial comparing the level of cooperation between the audiovisual distraction and control groups showed an increase in cooperation from 81% in the control group to 92% in the experimental group, indicating that distraction, like a cartoon, may modify a child's behavior [19].

Distraction refers to a process where there is competition between the sensation of pain and conscious, focused attention, which demands processing of information [20]. Distraction can be classified as internal and external distraction, which depends on the focus of attention. Internal distraction involves psychological factors like deliberate activation of the mind, while external distraction involves attention directed to stimuli in the environment [21].

Distraction techniques should be age-appropriate. While techniques like video games, animation are suitable for young children, breathing exercises, TV movies, and virtual reality are useful options for older children [22]. However, it was observed by other

researchers that active (playing video games) distraction techniques were better than passive distraction (watching a cartoon) techniques, and either of them was better than no distraction [8].

Distraction techniques are useful in children above the age of two years. Child-friendly environment with developmentally appropriate toys, well-chosen wall décor, engaging children in non-procedure related conversation helps, in addition to the distraction techniques in reducing pain and anxiety related to medical procedures [23].

Previous studies using video music distraction have found that it can reduce children's pain sensitivity and also stabilize vital parameters like heart rate, blood pressure, and respiratory rate during invasive procedures [24].

In their systematic review, Robinson et al. found that active, non-digital distractors consistently lead to a reduction in pain [25].

However, Uguchu et al. found that a passive distraction such as watching a cartoon was more effective than an active distraction such as blowing a bubble in reducing anxiety, fear and pain during venipuncture. This is likely due to the age difference in the study population, as the study was conducted on older children aged 6 to 8 years old [26].

Limitations

The study had a limited sample size and was conducted in a single center, which was one of the limitations. No formal screening was conducted to determine the presence of anxiety disorders in the study population. The skills of the nurse performing the procedure, which could influence the child's response, were not compared between the two groups.

Conclusion

Watching cartoons is an effective distraction that decreases pain during painful procedures like venipuncture in pre-school children. Hence, it is recommended to use a simple cost cost-effective strategy such as watching cartoons to alleviate the pain and reduce children's anxiety during painful procedures like venipuncture.

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Ethical Considerations

This study was commenced after approval from the Institutional Ethics Committee (protocol ID 610/2021, meeting held on 7/10/2021). Informed consent was obtained from the mothers of the children before enrolment into the study

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Conflict of interest

There is no conflict of interest.

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