

Short Communication

Effect of Virtual Reality and Audio Distraction on Pain during Painful Procedures among Children Admitted in a Tertiary Care Hospital

Venkatesaperumal D¹, Sumathy P²

¹Department of Child Health Nursing, Kasturba Gandhi Nursing College, Sri Balaji Vidyapeeth (Deemed to be University), Pondicherry, India.

²Vice Principal and Head, Department of Child Health Nursing, Kasturba Gandhi Nursing College, Sri Balaji Vidyapeeth (Deemed to be University), Pondicherry, India.

DOI: <https://doi.org/10.24321/2278.2044.202382>

I N F O

Corresponding Author:

Sumathy P, Department of Child Health, Nursing Kasturba Gandhi Nursing College, Sri Balaji Vidyapeeth (Deemed to be University), Pondicherry, India.

E-mail Id:

sumathyp@kgnc.ac.in

Orcid Id:

<https://orcid.org/0000-0002-0006-5280>

How to cite this article:

Venkatesaperumal D, Sumathy P. Effect of Virtual Reality and Audio Distraction on Pain during Painful Procedures among Children Admitted in a Tertiary Care Hospital. Chettinad Health City Med J. 2023;12(4):117-120.

Date of Submission: 2022-12-27

Date of Acceptance: 2023-08-17

A B S T R A C T

Introduction: Children face a variety of crises throughout their lives, often experiencing illness and hospitalisation in their early years. The procedural pain is worse than the illness. The ability to regulate pain through distraction seems to hold a lot of promise. The children can turn their attention away from their suffering with the aid of distraction. The main aim of the present study was to evaluate how children responded to pain during IV cannulations in the virtual reality group and the audio distraction group and compare them with the control group.

Material and Methods: A randomised controlled trial design was used in this study conducted on 75 children aged 8–12 years. By means of random assignment, the children were allotted to three groups (25 children in every group), namely the virtual reality group, audio distraction group, and control group. The Wong–Baker FACES Pain Rating Scale was used to measure the intensity of pain.

Results: The study findings showed a significant difference between the pain levels of the participants of the virtual reality group and the controls ($p < 0.001$), and also between the participants of the audio distraction group and the controls ($p < 0.001$).

Conclusion: The study findings imply that using audio and virtual reality distractions during intravenous cannulation can help children feel more at ease and experience less pain.

Keywords: Audio Distraction, Children, Distraction, IV Cannulation, Pain, Virtual Reality

Introduction

Children experience their first crisis when they become ill and are hospitalised.¹ On hospitalisation, they experience strange and terrible feelings. They may become coerced and agitated by negative emotions because they lack

experience and are fearful of pain and illness. The agony experienced by children during intravenous procedures is dreadful and astonishing. In paediatrics, pain perception is complicated and is influenced by a variety of biological, psychological, behavioural, and developmental factors.²

Chettinad Health City Medical Journal (P-ISSN: 2277-8845 & E-ISSN: 2278-2044)

Copyright (c) 2023: Author(s). Published by Advanced Research Publications



Almost all healthcare facilities use intravenous (IV) procedures on paediatric patients; they are an essential component of contemporary healthcare.³ Paediatric patients experience the most discomfort during intravenous procedures, and both the patients and their loved ones consider this to be a substantial source of distress.⁴

Numerous non-pharmacological techniques, including cutaneous stimulation and diversion therapy, are employed to give sufferers coping mechanisms for pain. This improves the efficiency of analgesia by decreasing fear, reducing perceived pain, and making pain more tolerable. The right usage of cutaneous stimulation has been shown to have a positive impact on lowering the perception of pain among all these modalities. A few techniques, including the use of pressure, simple rhythmic rubbing, hand massage, use of electric vibrators, and applying heat/ cold to the location before IV cannulation, can be used to stimulate the skin.⁵

The ability to control pain seems to be greatly improved by the diversion. It takes conscious concentration to feel pain. The youngsters can turn their attention away from their suffering with the aid of distraction. Distraction techniques are more likely to be effective with children because they pique a child's curiosity and encourage them to engage their auditory, visual, tactile, and kinaesthetic senses (when being moved). This effectively reduces the suffering brought on by unpleasant events.⁶

Distraction through virtual reality has gained importance in the healthcare field. There is a paucity of studies conducted in Puducherry related to the usage of virtual reality as a method of distraction to reduce pain among children.⁷ Hence, this study was undertaken with the aim of evaluating the effectiveness of virtual reality and audio distraction in reducing pain perception.

Material and Methods

The study design used in this study was a randomised controlled trial. The study was conducted in a tertiary care hospital in Puducherry from April 2022 to July 2022. Based on the eligibility criteria, 75 children in the age group of 8–12 years were selected for the study. School-age children who were critically ill, children with developmental delay, immediate post-operative children who were on sedation, and children who had received pain medication in the morning were not included in the study. The sample was divided into Study Group I (virtual reality group), Study Group II (audio distraction group) and the control group by simple randomisation process using the lottery method.

Tool Used

A structured questionnaire was used to obtain data regarding the demographic variables and the Wong–Baker

FACES pain rating scale⁷ was used to rate the intensity of pain.

Ethical Considerations

The Institutional Human Ethics Committee of Kasturba Gandhi Nursing College granted permission for this study (IHEC/2021/021). Informed consent as well as assent were obtained from the parents and children respectively.

Intervention

During IV cannulation, the children in the virtual reality group wore a headset connected to the mobile phone that took them to a fully immersive 3-dimensional virtual world that consisted of the Jungle Book for 1 minute, Underwater Aqua for 3 minutes, Jurassic World for 2 minutes, entering into the Disney Castle Roller coaster for 3 minutes, and playing with an elephant for 1 minute. The child wore the headset 5 minutes before the painful procedure and it was removed once it was over. The child was asked to indicate the level of pain felt after the IV cannulation using the pain scale.

In the audio distraction group, the children were allowed to listen to a story for 5 minutes and songs for the next 5 minutes. The child wore the headset 5 minutes before the painful procedure and it was removed when it ended. The child was asked to indicate the level of pain felt after the IV cannulation using the pain scale.

The control group received no intervention and the Wong-Baker FACES Pain Rating Scale was used to assess the pain.

Plan for Data Analysis

Descriptive statistics including percentage, frequency, and mean and standard deviation, as well as inferential statistics including independent t test were used to analyse the collected data.

Results

Out of 75 samples, the majority (6, 24%) in Study Group I (virtual reality group) and Study Group II (audio distraction group) were in the age group of 8–11 years, whereas most (7, 28%) of the children in the control group were 8 years old. The majority of the children were male in all three groups: Study Group I (virtual reality group) - 16 (64%), Study Group II (audio distraction group) - 13 (52%) and control group - 14 (56%).

The response related to pain experienced after the IV cannulation by most (17, 68%) of the children in the control group was "hurts worst", whereas in the virtual reality group and audio distraction group, the response of most of the participants was "hurts little more" (14, 56% and 12, 48% respectively) (Table 1).

Table 1. Assessment of Level of Pain

Variables	Virtual Reality Group (N = 25)		Audio Distraction Group (N = 25)		Control Group (N = 25)	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
Level of pain						
No pain	0	0	0	0	0	0
Hurts little more	14	56	12	48	0	0
Hurts even more	10	40	9	36	0	0
Hurts whole lot	1	4	4	16	8	32
Hurts worst	0	0	0	0	17	68
Mean \pm standard deviation	4.96 \pm 1.172		5.36 \pm 1.497		9.36 \pm 0.952	

The independent 't' test revealed a statistically significant difference between the pain levels in the virtual reality and audio distraction groups as compared to the controls at $p < 0.001$. No statistically significant difference was observed between the pain levels in the virtual reality and audio distraction groups. However, the mean score of the level of pain was non-significantly lower in the virtual reality group (4.96 \pm 1.17) as compared to the audio distraction group (5.36 \pm 1.49) (Table 2).

Table 2. Comparison of Level of Pain Experienced by Participants after IV Cannulation in the Three Groups (N = 75)

Groups	Mean	Standard Deviation	t Value	p Value
Study group I (virtual reality)	4.96	1.17	-1.05	0.298 NS
Study group II (audio distraction)	5.36	1.49		
Study group I (virtual reality)	4.96	1.17	-11.27	0.000*** HS
Control group	9.36	0.952		
Study group II (audio distraction)	5.36	1.49	-14.57	0.000*** HS
Control group	9.36	0.952		

NS: Not significant

***HS: Highly significant

Discussion

The current study was done to evaluate the impact of virtual reality and audio distraction on pain during painful procedures among children. The study results revealed that a statistically significant difference was observed in pain experienced by the subjects on comparing the two study groups with the control group.

No statistically significant difference was seen between the pain levels experienced in the virtual reality and audio distraction groups. However, the mean pain score level in the virtual reality group (4.96 \pm 1.17) was non-significantly lower as compared to that in the audio distraction group (5.36 \pm 1.49) which implied that distraction through virtual reality had a more positive impact in the reduction of pain. A significant reduction would have been observed if the sample size was larger.

The results of a related study that examined the impact of vibration, external cold, and virtual reality on pain in children belonging to the age group of 7 to 12 years and undergoing phlebotomy provide support to the findings of the current study. It was a randomised controlled trial in which 120 kids were divided into the virtual reality group, external cold and vibration group, and control group. Groups 1 and 2 were found to have reduced pain scores. Based on the total pain score, no difference was observed between groups 1 and 2. However, a statistically significant difference was observed in the pain levels on comparing groups 1 and 2 with group 3. The findings implied that vibration, external cold, and VR are useful in relieving pain in children aged 7 to 12 years.⁸

Conclusion

Distraction by virtual reality and audio distraction helps in considerable reduction in pain perception. Hence, such methods should be implemented in daily practice during painful procedures for children.

Source of Funding: None

Conflict of Interest: None

References

1. Bsiri-Moghaddam K, Basiri-Moghaddam M, Sadeghmoghaddam L, Ahmadi F. The concept of hospitalization of children from the view point of

- parents and children. *Iran J Pediatr.* 2011 Jun;21(2):201-8. [PubMed] [Google Scholar]
2. Cozzi G, Cognigni M, Busatto R, Grigoletto V, Giangreco M, Conte M, Barbi E. Adolescents' pain and distress during peripheral intravenous cannulation in a paediatric emergency setting. *Eur J Pediatr.* 2022 Jan;181(1):125-31. [PubMed] [Google Scholar]
 3. Tomás-Jiménez M, Díaz EF, Sánchez MJ, Pliego AN, Mir-Abellán R. Clinical holding in pediatric venipuncture: caring by empowering the caregiver. *Int J Environ Res Public Health.* 2021 Jul 11;18(14):7403. [PubMed] [Google Scholar]
 4. Trottier ED, Doré-Bergeron MJ, Chauvin-Kimoff L, Baerg K, Ali S. Managing pain and distress in children undergoing brief diagnostic and therapeutic procedures. *Paediatr Child Health.* 2019 Dec;24(8):509-35. [PubMed] [Google Scholar]
 5. Caprilli S, Vagnoli L, Bastiani C, Messeri A. Pain and distress in children undergoing blood sampling: effectiveness of distraction with soap bubbles: a randomized controlled study. *Child Nur Italian J Paediatr Nurs Sci.* 2012;4(1):15-8. [Google Scholar]
 6. Johnson MH. How does distraction work in the management of pain? *Curr Pain Headache Rep.* 2005 Apr;9(2):90-5. [PubMed] [Google Scholar]
 7. Wong-Baker FACES Foundation [Internet]. Wong-Baker FACES Pain Rating Scale; [cited 2023 Aug 19]. Available from: <https://wongbakerfaces.org/>
 8. Gerçeker GÖ, Binay Ş, Bilsin E, Kahraman A, Yılmaz HB. Effects of virtual reality and external cold and vibration on pain in 7- to 12-year-old children during phlebotomy: a randomized controlled trial. *J Perianesth Nurs.* 2018 Dec;33(6):981-9. [PubMed] [Google Scholar]