

Effectiveness of Visual Distraction In Reducing Pain Intensity During Intravenous Insertion Among Children Aged 3–5 Years

Reisy Tane¹, Dewi Tiansa Barus²

¹Universitas Sumatera Utara, Medan, Indonesia

²Institut Kesehatan Deli Husada Deli Tua, Medan, Indonesia

*Corresponding Author : *reisyane@usu.ac.id*

Article Info

Article received : May 12, 2026

Article revised : June 29, 2026

Article published : June 30, 2026

Abstract

Introduction: A common trigger for discomfort, particularly in pediatric inpatients, is intravenous (IV) catheter placement. Intravenous procedure can cause tissue damage that can cause pain and anxiety in toddlers. The objective of this study is to assess the effectiveness of virtual distraction in reducing pain intensity during IV line insertion in children. **Methods:** This research is quantitative research, with a quasi-experimental pre-post design. Respondents were selected using a purposive sampling method with the following inclusion criteria: children aged 3-5 years, with an IV installed, and willing to participate as research respondents. Exclusion criteria were children with complications such as phlebitis, decreased consciousness, or those receiving analgesic drugs. The sample size was 25 children. Data analysis involved univariate and bivariate approaches. Univariate analysis includes normality tests, especially the Shapiro-Wilk test, where the p-value is expected to be less than α (0.05), and bivariate analysis uses the Wilcoxon. **Results:** The results explain that p value 0.00 it' means there is a significant difference between the pre and post test. Based on the research results, it was found that pain during IV insertion was significant. Children who received visual distraction therapy experienced less pain than before receiving distraction therapy. **Conclusion:** Therefore, based on the results of this study, it is recommended that it be implemented in health services, especially in pediatric nursing rooms.

Keywords: Distraction; Pain intensity; Visual

Introduction

A common trigger for discomfort, particularly in pediatric inpatients, is intravenous (IV) catheter placement. Intravenous procedure can cause tissue damage that can cause pain and anxiety in toddlers. In response to the painful IV insertion process, children often exhibit a variety of reactions, such as crying, screaming, trying to hide their hands or the insertion site, refusing the procedure, or even pushing healthcare workers away¹. If the pain is not treated, it will cause trauma in the child which can lead to new health problems in the child^{2,3}.

When managing invasive procedures, pediatric nurses must implement atraumatic care interventions to minimize the physical and emotional impact on the child⁴. Children aged 3-5 years are in a developmental phase characterized by increased curiosity and imagination. However, it's important to note that children are particularly vulnerable to increased stress and anxiety when faced with medical procedures. During this time, children tend to have limited understanding of the rationale behind medical procedures and are more prone to fear. This fear can exacerbate pain perception and make medical experiences more traumatic⁵.

One effective nonpharmacological approach to reducing discomfort during IV insertion is the use of distraction techniques. Audiovisual distraction, such as encouraging children to watch cartoons, has been shown to be effective in reducing anxiety during hospitalization. This method not only relieves stress but also stimulates the release of endorphins, which further contribute to pain relief. This technique combines auditory and visual stimulation by engaging children in watching cartoons. The goal is for children to become so engrossed in the viewing experience that they are distracted from the pain associated with the medical procedure⁶.

Previous research explain that the levels of pain, anxiety, and medical fear after the invasive procedure were lower in the intervention groups than in the control group with virtual reality application⁷. The other research explain watching cartoon as a distraction has a significant impact on the comfort level (pain reduction) of preschool-aged children undergoing IV insertion at Taman Husada General Hospital in Bontang⁸.

Based on a preliminary survey General Hospital in Deli Serdang, in 2024 from January to August 2024, a total of 163 pediatric inpatients. We found that several children undergoing IV insertion showed signs of stress, two of whom were crying, screaming, and hysterical. This stress caused the children to experience trauma related to their experiences in the hospital. The distress caused by this trauma was exacerbated by the refusal of some parents to consent to certain medical interventions, especially when their children cried, became restless, and were difficult to calm down, even when only seeing a nurse passing by. Children's anxiety can be reduced by distracting them with their favorite animated cartoon shows on mobile devices. The objective of this study is to assess the effectiveness of virtual distraction in reducing stress during IV line insertion in children.

Methods

This research is quantitative research, with a quasi-experimental pre-post design. Respondents were selected using a purposive sampling method with the following inclusion criteria: children aged 3-5 years, with an IV installed, and willing to participate as research respondents. Exclusion criteria were children with complications such as phlebitis, decreased consciousness, or those receiving analgesic drugs. The sample size was 25 children.

The research procedure for measuring pain is carried out at the time of the first IV insertion and then entered into the observation sheet. Then on the third day, when installing the IV, the child is given virtual intervention using a tablet 5 minutes before the IV installation until 10 minutes after installation. The data collection tool used was the Wong Baker pain scale. The assessment was carried out by researchers by giving a show to children accompanied by their parents.

Interventions work by diverting a child's attention from painful stimuli and fear-provoking situations, such as seeing needles and IV line insertion. When a child focuses on engaging visual and auditory experiences, their attentional capacity for painful stimuli is reduced. Theoretically, this mechanism is related to the gate control theory of pain, which states that pain perception is influenced by attention, emotion, and sensory stimulation. Strong distraction can reduce the processing of painful stimuli, thus reducing the child's pain and anxiety.

In VR, the effect of distraction is even stronger because the child experiences an immersive experience, as if they were in a virtual environment. The child can see and hear engaging content, thus distracting attention from the IV insertion procedure. Research shows that VR can reduce pain and fear in children during IV procedures and can even help expedite the success of IV insertion. Intervention Delivery Method If using VR: The child wears a VR headset/head-mounted display (HMD) worn on the head during the IV line insertion. Content in the form of games or engaging virtual environments is provided before and during the procedure. With this method, the child doesn't need to hold the tablet because the screen is directly in front of their eyes, and the sound can be delivered through a headset. However, for younger children, headset use can be uncomfortable or difficult to maintain. If using a tablet as an audiovisual distraction: A tablet is not VR. The tablet can be placed in a visible position, for example, above or in front of the child, or held by a parent or

caregiver so the child can watch videos or play games while the IV line is inserted. This method is simpler and easier to implement, but the level of immersion is lower than VR. Studies on the use of iPads during IV cannulation have shown this approach to be feasible and preferred by parents, although one clinical trial did not find a significant reduction in pain compared to standard care^{10,11,12}.

Data analysis involved univariate and bivariate approaches. Univariate analysis includes normality tests, especially the Shapiro-Wilk test, where the p-value is expected to be less than α (0.05), and bivariate analysis uses the Wilcoxon.

Results

The results of this study were analyzed using univariate and bivariate techniques to assess the data.

Table 1 Characteristics of Respondents

Characteritics	Frequency (f)	Presentation (%)
Gender		
Male	10	40
Female	15	60
Age		
3	5	20
4	10	40
5	10	40
Frequency of Hospitalization		
First	15	60
Ever 1-2	3	12
Often > 2	7	28

According to Table 4.1, the majority of respondents were female (60%) most of the respondents were 4 to 5 years old around 40%. Then based on the Frequency of Hospitalization majority first experience 60%

Table 2 Pain Intensity In Children During IV Insertion Before After Distraction Therapy

Pain Intensity	Pre Test		Post Test	
	N	%	N	%
No Pain	0	0	0	0
Mild	4	16	16	64
Moderate	10	40	6	24
Severe	11	44	3	12
Total	25	100.0	25	100.0

Based on Table 4.2, it was obtained that the results of Pain Intensity before and after the distraction technique were carried out, there were no respondents in the No pain

category, 4 respondents (16%) had the Mild Pain category, 10 respondents (40%) had the Moderate Pain category, and 11 respondents (44%) had the Severe Pain category. Pain Intensity Results After the distraction technique was carried out, there were no respondents in the No Pain category, 16 respondents (64%) had the Mild Pain category, 6 respondents (24%) had the Moderate Pain category, and 3 respondents (16%) had the Severe Pain category.

Table 3 Bivariate analysis before and after the distraction technique was performed during IV line Chateter

Variabel	Mean rank	Z	p-value
Pre	13.5	-4.12	0.00
Post	8		

According to Table 4. The mean rank, or average decrease in pain intensity, was 13.5 with the Z score -4.12. the results explain that p value 0.00 it' means there is a significant difference between the pre and post test.

Discussion

This study demonstrated a significant difference in pain levels between the intervention and control groups after the visual distraction intervention. In the group exposed to visual distraction, pain intensity decreased significantly. Visual distraction proved effective in reducing pain in children during invasive procedures, as reflected by a significant p-value of 0.004, below the 0.05 threshold. The researchers hypothesized that distraction techniques serve as an effective approach to pain management, and this was supported by the observation that most children displayed calm facial expressions during IV insertion procedures while watching animated cartoons⁹.

Digital distraction interventions can be used as a non-pharmacological method to help reduce pain and distress in children during IV line insertion. The primary mechanism of this intervention is to divert the child's attention from painful stimuli to engaging stimuli, such as games, videos, or virtual environments. When a child's attention is focused on distracting activities, attention to the needle and invasive procedure is reduced, thereby decreasing the perception of pain and anxiety. The effectiveness of distraction is also influenced by the child's level of engagement in the activity. Interactive and engaging distractions can help children focus more on the activity during the procedure¹³.

In virtual reality (VR) interventions, children use a VR headset or head-mounted display (HMD) to view an immersive virtual environment. The use of VR can divert the

child's visual and cognitive attention from the IV line insertion process. Several studies have shown that VR can reduce pain, fear, and anxiety in children undergoing needle-related procedures. However, the effectiveness of VR is not consistent across studies, so child characteristics, the type of VR content, the child's level of engagement, and the clinical procedure need to be considered. For younger children who may refuse or have difficulty using a VR headset, a simpler alternative is tablet-based distraction. Tablets can display animated videos or games and be positioned so the child can see them during IV line insertion. In a study of tablet PCs in children aged 3–5 years, animated videos were delivered via tablet during IV insertion. This allows the tablet to be held by a parent or healthcare provider, or positioned so the child can see the screen without interfering with the IV insertion area¹⁴.

The researchers hypothesized that distraction techniques serve as an effective approach to pain management. This hypothesis is supported by the observation that most children displayed calm facial expressions during IV insertion procedures while watching animated cartoons. This study suggests that animated cartoon videos not only serve as effective pain relievers but also help distract children, making their fears and anxieties less conscious. This makes animated cartoon videos a useful distraction method for supporting children's comfort during medical procedures.

Conclusion

Based on the research results, it was found that pain during IV insertion was significant. Children who received visual distraction therapy experienced less pain than before receiving distraction therapy. Therefore, based on the results of this study, it is recommended that it be implemented in health services, especially in pediatric nursing rooms.

References

1. Marlina M, Donna R, Susilowati Y, Saputra R. Pengaruh terapi musik terhadap tingkat nyeri pemasangan infus pada pasien anak usia prasekolah di ruang anak Rumah Sakit Kanker Dharmas Jakarta tahun 2023. *Jurnal Ilmiah Ilmu Kesehatan dan Kedokteran*. 2023;2(1):107–114. doi:10.55606/termometer.v2i1.2807
2. Neto J, Fernandes R, Andrade L, Fernandes I, Martins T, do Céu Barbieri-Figueiredo M, Carvalho F, Lima L. Invasive procedures and atraumatic care in pediatric nursing

- practice: nurses' perceptions. *Front Pediatr.* 2025 May 15;13:1543138. doi: 10.3389/fped.2025.1543138. PMID: 40443573; PMCID: PMC12119488.
3. Wrona SK, Quinlan-Colwell A, Brown L, Jannuzzi RGE. Procedural pain management: clinical practice recommendations American Society for pain management nursing. *Pain Manag Nurs.* (2022) 23(3):254–58. 10.1016/j.pmn.2021.11.008
 4. Loeffen EA, Mulder RL, Font-Gonzalez A, Leroy PL, Dick BD, Taddio A, et al. Reducing pain and distress related to needle procedures in children with cancer: a clinical practice guideline. *Eur J Cancer.* (2020) 131:53–67. 10.1016/j.ejca.2020.02.039
 5. Bekar P, Erkul M, Efe E. The effect of using a kaleidoscope during central venous catheter dressing changes on pain and anxiety in children with cancer: a randomised controlled trial. *Eur J Oncol Nurs.* (2022) 57:102114. 10.1016/j.ejon.2022.102114
 6. Lenni Marlina, Andi, Handi. Pengaruh distraksi visual terhadap tingkat nyeri saat pemasangan infus pada anak umur 3–6 tahun di Ruang Flamboyan RSD dr. H. Soemarno Sosroatmodjo. *Aspiration of Health Journal.* 2023;1(1):146–152. doi:10.55681/aohj.v1i1.95.
 7. Goktas N, Avci D The effect of visual and/or auditory distraction techniques on children's pain, anxiety and medical fear in invasive procedures: A randomized controlled trial *Journal of Pediatric Nursing: Nursing Care of Children and Families,* 2023; 73, e27-e35
 8. Candra, Y., & sutrisno amiruddin. (2023). Pengaruh Distraksi Menonton Film Kartun Terhadap kenyamanan (Nyeri) pada anak usia Prasekolah yang mengalami pemasangan infus di RSUD Taman Husada Bontang. *Jurnal Cakrawala ILMiah,* 3(4), 1–14. <https://www.ncbi.nlm.nih.gov/books/NBK558907/>
 9. Somantri, B., & Manalu, L. O. (2018). Distraksi Visual Kartu Menurunkan Tingkat Nyeri Saat Pemasangan Infus Pada Anak Usia Prasekolah. *Jendela Olahraga,* 3(2), 1–8. <https://doi.org/10.26877/jo.v3i2.2381>
 10. Chen YJ, et al. Distraction using virtual reality for children during intravenous injections in an emergency department: a randomised trial. *J Clin Nurs.* 2020;29:503–510.
 11. Eijlers R, et al. Virtual reality for pain and anxiety during pediatric medical procedures: a systematic review and meta-analysis. *Clin J Pain.* 2019.
 12. Czub M, Serrano-Ibáñez ER, Piskorz J, Esteve R, Lydon HK, López-Martínez AE, et al. Virtual reality distraction for needle-related pain and distress in children: a multicenter randomized controlled trial. *Cyberpsychol Behav Soc Netw.* 2024;27(6):409–419. doi:10.1089/cyber.2023.0454
 13. Ali S, Ma K, Dow N, Vandermeer B, et al. A randomized trial of iPad distraction to reduce children's pain and distress during intravenous cannulation in the paediatric emergency department. *Paediatr Child Health.* 2021;26(5):287–293. doi:10.1093/pch/pxaa089.

14. Kwon JH, et al. Tablet personal computer distraction during intravenous placement for young children in the pediatric emergency department: a pilot study. *Pediatr Int*. 2022. doi:10.1111/ped.15150.