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The Effectiveness of Animated Educational Videos In Reducing Pain During IV Catheter Insertion In Pre-School Children

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ABSTRACT

Background: One of the most feared and painful invasive procedures for children is the insertion of an IV. The pain caused by the IV catheter insertion can be traumatizing, leading to anxiety about various hospital procedures. Understanding the procedures involved can be a strategy for managing anxiety and pain. The aim of the study is to identify the effectiveness animated educational video about IV catheter insertion on children's pain compare with the others intervention. **Methods:** This quantitative research used quasy-experimental design approach to compare three interventions between Animated Educational Video, Cartoon Video and Control Group. The respondents of study were selected by consecutive sampling which it starts on April until June 2022. It was conducted at emergency unit from three local hospitals area in Bali Province. Total respondents were about 90 children divided into three groups. Data was collected using *Wong-Baker Faces Pain Scale* as the instrument. **Results**: This study found that there was a significant difference between three intervention groups (α=0,001 $p<0,05$) and the animated education video group showed lowest mean pain score (1.87) compared to other group interventions. **Discussion**: Pediatric nurse at emergency unit has special role to facilitate this animated educational video as the strategy for pain control and educate the children.

Keywords : Animated educational video; cartoon video; parent-child interaction; pain; children

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INTRODUCTION

Children represent one of the most vulnerable populations to hospitalization. The various diagnostic and therapeutic procedures they undergo, such as intravenous (IV) insertion, often constitute significant and stressful experiences during their hospital stay (Lee et al., 2014). IV insertion is among the most common invasive procedures performed on pediatric patients receiving hospital care (Wong et al., 2019). This peripheral vein intervention frequently induces pain, fear, and psychological distress in children (Düzkaya et al., 2021). A child's perception of pain is multifaceted, influenced by behavioral, physiological, psychological, and developmental factors (Lee et al., 2014). Humphrey et al. (1992) reported that children aged 2.5–6 years exhibit higher levels of distress—approximately 83%—in response to pain from invasive procedures compared to school-aged children (Wong et al., 2019). The manifestation of distress or anxiety-related behaviors serves as a form of communication through which children express their pain and apprehension (Sembiring et al., 2015). Evidence further suggests that pain experienced during invasive procedures may elicit excessive anxiety and potentially lead to long-term traumatic consequences in a child's life (Kaur et al., 2014; Marsh et al., 2014).

Nurses, as healthcare professionals who have the most frequent and direct contact with patients, particularly those undergoing intravenous (IV) insertion, play a crucial role in implementing strategies to manage pain and anxiety in pediatric patients. This responsibility aligns with the principles of atraumatic care, which emphasize minimizing psychological and physical distress in children (Cahyani et al., 2018). Among various approaches, distraction techniques have been identified as effective, simple, and rapid methods for reducing pain and anxiety in preschool-aged children during invasive procedures (Bagheriyan et al., 2012; Pourmovahed et al., 2013). The primary goal of distraction is to redirect a child's attention away from perceived threats or anxiety related to the medical procedure, thereby decreasing their focus on discomfort (Gudu Tufekci et al., 2017). Commonly utilized distraction methods include balloon inflation, listening to music, engaging in parent–child interaction, playing video games, and watching animated cartoons (Düzkaya et al., 2021; Moline et al., 2021).

In addition to the use of distraction techniques, providing information that is tailored to the child's age and developmental stage regarding upcoming medical procedures is also highly recommended. Such information helps children form realistic expectations and better prepare for the situation they will experience. Nevertheless, many healthcare professionals refrain from explaining procedures to children, assuming that their cognitive limitations prevent them from understanding the information (Hughes, 2012). This lack of explanation can heighten children's fear and subsequently lower their pain tolerance during procedures. Therefore, it is essential to develop appropriate informational media that can effectively capture children's attention and enhance their comprehension. One promising approach is the use of educational media in the form of animated videos (Düzkaya et al., 2021). However, research examining the effectiveness of

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animated educational videos in reducing children's fear and anxiety responses remains limited, particularly in Indonesia. Hence, it is important to investigate the comparative effectiveness of animated educational videos and commonly used distraction methods, such as watching cartoon videos, in managing children's anxiety during intravenous insertion procedures.

MATERIAL AND METHOD

This quantitative study employed a quasi-experimental design to compare three intervention groups: an Animated Educational Video group, a Cartoon Video group, and a Control group. Participants were recruited using a consecutive sampling technique over a three-month period from April to June 2022.

The research was conducted in the emergency departments of three hospitals in Bali Province—RSAD Udayana in Denpasar City, RS Mangusada in Badung Regency, and RSUD Sanjiwani in Gianyar Regency. These hospitals were selected due to their comparable service levels and substantial pediatric patient volumes. Each month, approximately 25–30 pediatric patients of various ages presented to these units, most undergoing intravenous (IV) insertion procedures. To avoid ethical conflicts, each hospital applied a different intervention group. Ethical approval for this study was granted by the Institutional Review Board and Ethics Committee of STIKES Bina Usada, with approval number 049/EA/KEPK-BUB-2022.

The inclusion criteria were children aged 3–6 years, cooperative children and parents, normal visual and auditory function, and classification under the green triage category. Exclusion criteria included children with behavioral or mental disorders, decreased consciousness, or those under the influence of sedatives or analgesics. A total of 90 participants were enrolled and evenly divided into three groups (n = 30 per group). Children's pain levels during IV insertion were assessed using the *Wong-Baker Faces Pain Scale* a validated and reliable instrument (McMurtry et al., 2011). The Wong-Baker Faces Pain Scale is a five-face pictorial scale scored from 1 to 5, representing emotional expressions ranging from neutral (1 = low pain) to very painfull (5 = severe pain).

Data collection was carried out by three trained nurses who were part of the research team. Prior to data collection, the nurses underwent a briefing session to standardize their understanding of anxiety assessment. Both parents and children were provided with detailed information about the study, and verbal and written informed consent were obtained. IV insertion was performed by nurses of equivalent clinical competency, each with at least five years of pediatric IV insertion experience. The procedure duration ranged from 1–5 minutes, depending on the child's vein condition, and a 24-gauge peripheral catheter was used in accordance with the child's age. Pain assessment was performed by the nurse administering the IV insertion.

In the Animated Educational Video group (Group 1), participants watched an animated educational video about the IV insertion process both before and during the procedure. The content was designed to align with the cognitive and emotional development of children aged 3–6 years. The video was produced by a computer programmer under the researchers' guidance and featured a character named *Gek Cening* as the narrator, explaining the purpose of IV insertion, the equipment used, and the step-by-step procedure. The

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video, lasting approximately 2 minutes and 47 seconds, was reviewed and refined based on input from two pediatric nursing experts (Figure 1).

Figure 1. "Gek Cening" explained about the IV catheter Insertion Procedure

Children in Group 2 (Cartoon Video) watched a cartoon during the IV insertion procedure. Three popular cartoons preferred by children aged 3–6 years were preselected based on feedback and preferences gathered from 15 children within the same age group, such as Tayo or Upin Ipin cartoon. Prior to the procedure, each child was allowed to choose one of the selected cartoons, which was then played on a mobile phone screen throughout the IV insertion process.

In the Control Group, parents were permitted to remain with their child and engage in verbal and physical interaction (parent–child interaction) during the procedure to provide comfort and reassurance. No pharmacological interventions were routinely employed to reduce pain related to IV insertion in the participating hospitals. All parents in this study were present beside their children during the IV catheter insertion procedure.

Figure 2. The patient is watching the Animated Educational Video

RESULTS

Characteristics of Respondents

Table 1 presents the demographic characteristics of the respondents. The majority of participants in two of the groups were male (while the Cartoon Video group showed a balanced gender distribution). Most children experienced intravenous insertion for the first time, and the average age of participants ranged between 3 and 4 years.

Table 1. Comparison of respondents' characteristics across the three groups (n = 90)

Characteristics	Animated Education Video (n=30)		Cartoon video (n=30)		Parent-child interaction (n=30)	
Gender						
Male (f,%)	21	70%	15	50%	25	83.3%
Female (f,%)	9	30%	15	50%	5	16.7%
The frequency of IV insertion						
1 (f,%)	23	76.7%	25	83.3%	26	86.7%
2 (f,%)	3	10%	4	13.3%	3	10.0%
3 (f,%)	4	13.3%	1	3.3%	0	0%
>4 (f,%)	0	0%	0	0	1	3.3%
Age						
Mean (SD)	4.56 (0.90)		4.39 (1.06)		3.65 (0.98)	
Median (Min-max)	4.22 (3 – 6)		4.00 (3 – 6)		3.10 (3 – 6)	

Table 2. Results of the Data Normality Test and Kruskal-Wallis Test for Pain Responses in Each Intervention Group (n = 90)

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Variable	Mean±Std. Deviasi	Median	Min-Max	95% CI	Uji Normalitas Data	Mean Rank	Kruskal Wallis
Video edukasi animasi	1.87 ± 0.97	2	1-5	1.50 - 2.23	0.001	32.27	0.001
Video animasi kartun	2.47 ± 1.08	2	1-5	2.07 – 2.87	0.004	46.50	
Interaksi orangtua-anak	3.07 ± 1.29	3	1-5	2.59 – 3.55	0.008	57.73	

et al., 2022). Moreover, children aged 24–59 months (2–5 years) have a lower risk—less than 64%—of IV insertion failure during their first attempt compared to those under 24 months (2 years), as older children generally have veins that are easier to access (Aytenew et al., 2022).

Based on the respondents' ages, the average age ranged from 3 to 4 years. This corresponds to the vulnerability of children under five, whose immune systems are still developing, making them more prone to various illnesses that often require hospitalization. According to the World Health Organization (WHO), children under five are at higher risk for multiple diseases and contribute significantly to the global child mortality rate, which was recorded at 37 deaths per 1,000 live births in 2020 (World Health Organization, 2023). Furthermore, younger children—particularly those under one year old—are more likely to experience severe symptoms from illnesses compared to older children, thus requiring more intensive medical care (Kanté et al., 2015).

DISCUSSION

In this study, the number of male respondents was higher than that of females in two groups; however, in the animated cartoon group, the proportion of males and females was equal. This finding aligns with data from the 2019 survey by the Ministry of Women's Empowerment and Child Protection of the Republic of Indonesia, which reported that boys were more likely to experience illness and require hospital treatment than girls in both urban and rural settings (Profil Anak Indonesia, 2020). These findings may be associated with biological differences in immune response, as females tend to have lower susceptibility to viral infections compared to males (Heny Purwati et al., 2022).

Most respondents across the three groups were undergoing their first experience with IV insertion. This is linked to their prior hospitalization history and the type of illness they had. Children with chronic conditions often undergo IV insertion procedures more than four times, which can influence their pain tolerance and anxiety levels (Triana et al., 2021). Repeated IV insertions may also cause scarring, potentially affecting the success of future cannulations. The success of IV cannulation in children is largely determined by several factors, such as vein visibility, palpability, and the presence of scars from previous IV access (Al-Awaisi

The findings of this study indicated a significant difference among the three groups, with the animated educational video proving to be the most effective intervention. Although this group recorded the lowest anxiety scores compared to the other two interventions, the difference in scores was relatively small. The average post-procedure anxiety levels across all groups ranged from 1 to 2, which falls under the category of mild anxiety. According to Düzkaya et al. (2020), watching cartoons or animated educational videos effectively helps manage not only children's pain but also anxiety during IV insertion procedures. Both methods aim to distract children during invasive procedures. However, animated educational videos not only serve as a

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distraction but also enhance children's understanding of the procedure, thereby helping to reduce anxiety responses (Düzkaya et al., 2021). This effect may be attributed to the redirection of a child's attention toward engaging visual and auditory stimuli, which helps alleviate pain and anxiety (Chavan & Naregal, 2021; Rezai et al., 2016). Thus, using animated educational media captures children's interest through both sound and visuals, making the experience both informative and entertaining while familiarizing them with the IV insertion process.

The use of cartoon videos as a comparison intervention can also be effective in helping manage children's anxiety during medical procedures, as they serve to divert the child's attention away from discomfort (Ayu Habiba et al., 2021; Kaur et al., 2014). However, Inan (2019) reported different findings, indicating that video games were more effective in reducing pain and anxiety among pediatric patients compared to watching cartoons. This may be due to the multisensory engagement required in playing video games, which demands a higher level of concentration. As a result, children become deeply immersed and less aware of their surroundings—making this active distraction technique capable of blocking multiple sensory inputs, thereby alleviating pain and anxiety (Inan & Inal, 2019). Another study also showed that not only videos from smartphones, but also distraction videos from immersive virtual reality were also proven effective in reducing pain in children undergoing IV insertion in the emergency room (Gold et al., 2021). The animated education video also effective in reducing anxiety of children during IV insersion in emergency room (Triana et al., 2023).

In addition, the control group in this study utilized parent–child interaction as a routine approach to help reduce children's anxiety. The presence of a parent beside the child during painful procedures is known to help the child better manage pain and anxiety (Inan & Inal, 2019). Nurses should ensure that parents are present during such procedures and guide them on how to effectively distract their child's attention from the medical process. It is important to note that in this study, parents merely stood by and talked to their child without using any other distraction techniques. This indicates that rather than having parents passively provide verbal comfort, encouraging them to actively engage in distraction methods could be more effective in reducing children's anxiety.

CONCLUSION

This study created an animated educational video with the anime as the narrator to explain the IV insertion procedure. Children who received education through this animated video exhibited lower pain levels compared to those in the cartoon video only and routine intervention groups. Pediatric nurses are encouraged to use animated educational videos as a tool to help children better understand and reframe their perceptions of upcoming medical procedures, thereby reducing their pain during IV insertions.

Conflict of Interest

The authors declare no conflict of interest.

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