

Nurses' Perceptions and Readiness to Use Virtual Reality Distraction in Paediatric Pain Management

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ABSTRACT

Background: Pain, among hospitalised children, is often undertreated, leading to negative physical and psychological outcomes. Virtual Reality Distraction (VRD) has emerged as an evidence-based, non-pharmacological method that is child-friendly and nurse-applicable. **Objectives:** This study explores nurses' perceptions and readiness to use VRD as a strategy for paediatric pain management. **Methods:** A mixed-methods design was applied, combining a survey and focus group discussions (FGDs). The study was conducted in the paediatric ward of a government hospital in Bandung, Indonesia, between August and November 2023. A total of 40 nurses completed a 15-item readiness questionnaire, while 10 nurses participated in FGDs. Quantitative data was analysed using descriptive statistics, whereas qualitative data was examined using thematic analysis. **Results:** The findings indicated moderate readiness among nurses, with 52.6% scoring positively in both the cognitive and affective domains and 57.9% in behavioural readiness. Thematic analysis revealed five major themes regarding VRD: limited familiarity with its use, lack of integration into current nursing practice, age appropriateness of its application, the importance of age-specific content, and the need for structured training. While nurses recognised VRD as potentially effective, they emphasised practical considerations, such as training, infrastructure, and patient suitability. **Conclusion:** Nurses demonstrated moderate readiness and positive perceptions toward implementing VRD for paediatric pain management, highlighting its potential integration into routine care. However, readiness alone is insufficient; successful adoption requires addressing practical barriers such as staff training, age-appropriate content, and adequate infrastructure. Broader multi-site studies are recommended to validate these findings and support scalability. Hospitals should prioritise training, evidence-based guidelines, and interdisciplinary collaboration to establish VRD as an affordable, effective, and sustainable component of paediatric nursing practices.

Keywords: Cognitive Readiness; Innovation Adoption; Non-Pharmacological Intervention; Nursing Technology; Qualitative Research

INTRODUCTION

Pain is a multifaceted sensory and emotional unpleasant experience due to actual or potential tissue damage (Bahrudin, 2017; Brand & Thorpe, 2016). Pain remains one of the most distressing and disruptive experiences for patients, particularly in hospitalised children (Nurhanifah & Sari, 2022). When a child is hospitalised, they may experience a range of emotions. In addition to the pain caused by their illness, the child may also feel fear and anxiety due to invasive procedures. A study by Romualdo *et al.* (2024) found that fear of pain is associated with heightened pain perception and is influenced by negative emotional states such as anxiety and stress, which can amplify both the anticipation and the intensity of pain. Additionally, a meta-analysis by Zale *et al.* (2013) confirmed a significant positive association between fear of pain and pain intensity, supporting the notion that fear contributes to the amplification of pain experiences.

Pain is a stimulus that is given and will be transmitted and affects the sympathetic nervous system. The physiological symptoms that appear are increased breathing rate and increased blood pressure (Aydın & Özyazıcıoğlu, 2019). Appropriate pain management strategies must be tailored to the type of pain, whether acute or chronic (Pinzon, 2016). Many factors influence the pain experienced, including age, gender, culture, environment, and the individual, as well as anxiety and stress (Nurhanifah & Sari, 2022). Pain side effects may

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include cardiovascular, respiratory, gastrointestinal, urinary, endocrine, haematological, and immune effects and psychological changes such as anxiety, insomnia, demoralisation, depression, and impaired concentration. One effective non-pharmacological pain management technique involves distraction, which redirects the patient's focus away from their pain using auditory, visual, tactile, or cognitive methods. This technique is believed to minimise pain perception by activating the descending control system, reducing the transmission of pain signals to the brain (Nurhanifah & Sari, 2022).

Virtual Reality Distraction (VRD) represents a form of distraction employed in pain management for patients (Jones *et al.*, 2016). Virtual Reality (VR) is recognised as a cost-effective technological tool that can be seamlessly integrated into clinical procedures. This method is particularly suitable for paediatric care units due to its appeal to various age groups and adaptability to mobile devices. VR is currently recognised as a safe and cost-effective non-pharmacological method, particularly suitable for paediatric procedures. Studies show its potential in managing preoperative anxiety, wound care, and routine procedures (Jeong & Lee, 2019).

Despite the global recognition of VRD's effectiveness, there is limited research exploring nurses' perceptions and readiness to use this technology in Indonesia's paediatric settings. The application of new technologies, such as virtual reality distraction in Indonesia, still needs to be improved. Only a few hospitals have implemented this technology in patient care interventions. Moreover, nurses often reject a new intervention because it is considered complex, unfamiliar, and an additional burden on their work. To thoroughly assess the potential benefits of VRD as an intervention for pain management, it is imperative to conduct a study focusing on the perception and readiness of nurses to incorporate this intervention into their practice. Moreover, Saunders and Vehviläinen-Julkunen (2016) stated that nurses' readiness influences their ability to implement new interventions in patient care. This study provides novelty by being one of the first in Indonesia to explore the cognitive, affective, and behavioural readiness of paediatric nurses while also capturing their perceptions through qualitative inquiry. The integration of mixed methods offers a more comprehensive understanding that has not yet been reported in the Indonesian context, thereby filling a critical gap in evidence and informing future strategies for VRD adoption in paediatric pain management.

METHODOLOGY

Study Design

The study used a mixed-methods design, combining quantitative and qualitative approaches. The qualitative approach used was Focus Group Discussion (FGD). The study explored nurses' perceptions and readiness for virtual reality distractions as pain management in children. This study was conducted between August to November 2023. The sample for this study were nurses working in the paediatric ward at a government hospital in Bandung City, West Java Province, Indonesia. The study involved a sample size of 40 nurses, with 10 participating in the focus group discussion. Inclusion criteria include nurses who actively work in the children's room, have worked there for at least one year, and are not on leave. The exclusion criteria are being sick or stopping work during the study process. The sampling technique used in this study was purposive sampling, where respondents were recruited according to the requirements set. The sampling technique for this research was through hospital administration, involving the head of care in the children's room. Although the FGD involved a relatively small sample size ($n=10$), it was deemed sufficient due to the attainment of thematic saturation, where no new themes emerged during the final sessions. The discussions provided rich, detailed, and diverse perspectives that allowed for meaningful thematic development. Participants shared in-depth experiences and insights, which contributed to a comprehensive understanding of the topic. Therefore, the sample size was considered adequate for the qualitative objectives of this study.

Data Collection

The study was conducted from August to November 2023 at Bandung Kiwari Hospital. It was administered online. Focus Group Discussions (FGDs) were conducted via Zoom, involving nurses as participants. The discussions were recorded using video devices and later transcribed verbatim for further analysis. The variables studied in this study include nurses' readiness to implement virtual reality distraction and paediatric nurses' perceptions regarding virtual reality distraction. Nurses' readiness to implement virtual reality distraction was measured using a 15-item questionnaire developed by previous researchers (Mirza *et al.*, 2019). Nurse readiness for VRD includes cognitive, clinical, and professional capabilities. Nurse readiness is measured through a quantitative approach. Nurse readiness has three components, namely cognitive, affective, and psychomotor

readiness. The affective component of readiness refers to an individual's intention to implement VRD, which can be influenced by perceived obstacles such as workload and available spare time for training or efforts to implement VRD.

On the other hand, readiness in the psychomotor aspect involves self-assessment of the implementation of VRD, including the perceived importance of VRD and the benefits obtained from its implementation in clinical practice. This nurse readiness questionnaire has been tested for validity and reliability with a validity index of more than 0.361 and a reliability value (Cronbach's alpha) of 0.852. The 15 questionnaire items used in the study are provided in Table 2. These items were developed based on Mirza *et al.* (2019) to assess cognitive, affective, and behavioural aspects of nurse readiness. Meanwhile, the nurses' perceptions were studied qualitatively through focus group discussions. Nurses' perceptions were intended to assess how paediatric nurses view both beliefs and attitudes toward the importance of virtual reality distraction as pain management in children.

Data Analysis

The analysis used in this study includes descriptive analysis and qualitative analysis. Descriptive analysis uses frequency distribution and percentage proportion to describe age, gender, length of service in the hospital, level of education, and nurses' readiness for virtual reality distraction. Meanwhile, qualitative analysis to explore nurses' perceptions of virtual reality distraction uses thematic analysis. Thematic analysis was conducted following the framework by Braun and Clarke (2006). The coding process involved familiarisation with the data, generating initial codes, searching for themes, reviewing themes, and defining and naming them. Coding was carried out manually by two independent researchers to enhance reliability, and any discrepancies were resolved through discussion until consensus was reached. To ensure the trustworthiness of the qualitative findings, several strategies were employed. Triangulation was conducted by comparing findings from surveys and FGDs. Member checking was carried out by sharing preliminary themes with a subset of participants for validation. Additionally, inter-coder agreement between researchers helped strengthen the credibility and dependability of the analysis.

Ethical Consideration

The research obtained ethical clearance from the Research Ethics Committee, Universitas 'Aisyiyah Bandung, Indonesia with reference number 677/KEP.01/UNISA-Bandung/VIII/2023 on 19th August, 2023.

RESULTS

Nurses' Characteristics and Readiness for Virtual Reality Distraction

In this study, the paediatric nurses who took part were registered employees at the hospital. According to Table 1, most of the paediatric nurses were aged 25-29 (67.5%), and more than half were female (55%). The majority of paediatric nurses were professional (90%) and had between one and five years of experience working in the paediatric ward (80%).

Table 1: Characteristics of Paediatric Nurses (n=40)

Characteristics	Frequency (f)	Percentage (%)
Age		
21-24 years	3	7.5
25-29 years	27	67.5
30-40 years	6	15
More than 40 years	4	10
Gender		
Male	18	45
Female	22	55
Education Degree		
Nursing vocational	4	10
Nursing bachelor	36	90
Length of Time Working in the Paediatric Ward		
1-5 years	32	80
6-10 years	6	15
More than ten years	2	5

According to Table 2, the nurses' readiness to use Virtual Reality Distraction (VRD) to manage pain in children has three components: cognitive, affective, and psychomotor. Most of the paediatric nurses are prepared to use virtual reality in all three aspects, with percentages of 52.6%, 52.6%, and 57.9%, respectively.

Table 2: Nurses' Readiness to Use Virtual Reality (VR)

Item	Questions
1	The use of virtual reality (VR) can facilitate the introduction of pain management interventions for pediatric patients.
2	I believe VR should become an integral component of daily pain management practices in paediatric care.
3	VR should be considered a significant non-pharmacological approach within clinical nursing pain management.
4	The application of VR has the potential to enhance healthcare outcomes, particularly in paediatric pain management.
5	I am willing to participate in the development of nursing guidelines for pain management incorporating VR.
6	I am interested in utilising VR as part of the nursing care I deliver.
7	I actively seek out scientific evidence to support the implementation of VR in clinical practice.
8	I am reluctant to dedicate my personal time to learning about VR applications.
9	Integrating evidence-based VR interventions disrupts my routine clinical responsibilities.
10	Reviewing scientific literature on VR in pain management is unengaging to me.
11	I am open to incorporating VR into my professional practice.
12	The use of VR is not currently a professional priority for me.
13	I do not prefer to incorporate VR technology into my clinical duties.
14	Research on VR is not pertinent to paediatric pain management practice.
15	I tend to disregard information I have received regarding VR.

Nurses' Perceptions of VRD as Pain Management in Paediatrics

Nurses' perception of readiness to implement virtual reality distraction as pain management in children was also examined qualitatively through the perspectives of 10 paediatric nurses. Based on Table 3, participants in this study ranged in age from 26 to 34 years old.

Table 3: Nurses' Readiness Regarding VRD as Pain Management in Paediatric (n=40)

Components of Nurse Readiness	Frequency (f)	Percentage (%)
Cognitive Readiness		
High	22	55
Low	18	45
Affective Readiness		
High	22	55
Low	18	45
Psychomotor Readiness		
High	24	60
Low	16	40

The ten participants were identified as paediatric nurses who had worked in the paediatric ward for one and a half years to six years (Table 4).

The study comprised five main themes. These five themes include nurses not being familiar with virtual reality distractions, the absence of VRD as part of nursing interventions, the standard age of children suitable for using VRD, the type of pain management in VRD needing to be appropriate to the child's age, and the necessity for nurses to receive comprehensive VRD socialisation and training.

Table 4: Characteristics of Participants in Focus Group Discussion

Participant Code	Age	Length of Work in Paediatric Ward
P1	34 years old	Six years
P2	32 years old	Three years
P3	28 years old	Two years
P4	28 years old	Three years
P5	27 years old	Two years
P6	29 years old	Three years
P7	30 years old	Four years
P8	31 years old	Five years
P9	28 years old	Two years
P10	26 years old	One and half years

Theme 1: Nurses are not familiar with virtual reality distractions

This theme was identified from participant data indicating that nurses were still not familiar with VRD. Nurses mentioned that they had not been introduced to VRD in the hospital and were unaware that this tool could be utilised as a nursing intervention. The following quote exemplifies this perspective:

"I have seen virtual reality distractions but have yet to use them in person." (P1, six years' experience as a paediatric nurse)

"I know that virtual reality distraction has never been implemented in a hospital. I do not see the use and purpose of the tool." (P2, three years' experience as paediatric nurse)

Theme 2: The absence of VRD as part of nursing interventions

The theme was derived from participant data, which suggested that participants perceived virtual reality distraction more as an entertainment element in children's and adult games. Additionally, many nurses noted that they had not personally utilised virtual reality distraction. The following quote exemplifies this perspective:

"Virtual reality distractions are more for gaming and are widely used in play areas in educational centres. I do not know if such a device can be implemented in a hospital." (P9, two years' experience as a paediatric nurse)

"I did not know that virtual reality distraction could be used to reduce pain in children. Is this true?" (P3, two years' experience as a paediatric nurse)

"I have seen virtual reality distractions many times but have never used them directly, including for nursing interventions." (P7, four years' experience as a paediatric nurse)

Theme 3: The standard age of children suitable for using VRD

The following theme emerged from the participant data: there needs to be a match between children's ages and the use of virtual reality distraction. Nurses also mentioned that virtual reality distractions would be more challenging for younger children. This is illustrated in the following quote:

"Virtual reality distraction is more appropriate for school-age children or teenagers." (P4, three years' experience as a paediatric nurse)

"Children or teenagers usually use virtual reality distractions for virtual games." (P7, four years' experience as a paediatric nurse)

"Virtual reality distractions seem more difficult for children under six because children of that age are more fussy and will find it challenging to use." (P6, three years' experience as a paediatric nurse)

"I do not know the device's size, but if it is significant and used by a child under six, it will undoubtedly be more challenging to apply." (P8, five years' experience as a paediatric nurse)

Theme 4: The type of pain management in VRD must be appropriate to the child's age

This theme emerged from participant data that reported that there needs to be appropriate video content or viewing material in virtual reality distraction to divert the pain felt by the child. The following quote shows this:

"...videos played on VRD must be adjusted to the child's age. If the child is younger, they can watch simple shows such as Riko the Series or Omar and Hana." (P4, three years' experience as a paediatric nurse)

"I think VRD shows for older children should be age-appropriate; they will get bored if the videos are for younger children." (P6, three years' experience as a paediatric nurse)

"The topic of the VRD video must be the child's character; sometimes some children prefer video games, some like the Upin Ipin show, and some like challenges..." (P10, one and half years' experience as a paediatric nurse).

Theme 5: Adequate training for nurses regarding VRD strategies

This theme emerged from participant data that reported socialisation regarding this distraction technique.

Several participants also stated that they had to be updated with new technological developments and knowledge. However, several participants admitted that they had yet to be informed about the implementation of VRD and needed training. The following quote shows this:

"I think VRD is exciting, and there should be further training if it is to be implemented in children..." (P1, six years' experience as a paediatric nurse)

"I cannot imagine how VRD is given to children. Especially children who have to undergo invasive interventions are likely to be afraid, fussy, and uncooperative. It seems like nurse training is required before doing it directly." (P5, two years' experience as a paediatric nurse)

"I think implementing VRD requires training or simulation for pain management in children." (P9, two years' experience as a paediatric nurse)

DISCUSSION

The study findings revealed that nurses are ready and positively perceive using Virtual Reality Distraction (VRD) as a nursing intervention for managing pain in children. These findings indicate that nurses have a favourable view of VRD and are confident in their ability to incorporate it as an intervention in nursing care for paediatric patients. VRD is one of the technology-based interventions that has yet to be widely implemented, especially in Indonesia. Unlike in developed countries such as the United States, South Korea, and Australia, where VRD has been integrated into paediatric pain management protocols and evaluated through multiple clinical trials, Indonesian hospitals are still in the exploratory stage of adopting such digital health innovations. However, based on existing studies, applying digital technology-based interventions is considered an evidence-based nursing practice (EBNP) that can improve the quality of nursing care (Irmayanti *et al.*, 2019). Evidence-based nursing practice integrates external research, clinical expertise, and patient preferences to inform healthcare decisions (Rector & Polivka, 2013). Utilising the latest evidence addresses challenges in patient care and moves beyond reliance on experience alone. The goal is to minimise unnecessary or harmful interventions, ensuring a safer, more effective healthcare environment (Raman & Sullivan, 2024). Therefore, VRD, when used by trained nurses as a nursing practice intervention to reduce pain in paediatric patients, needs attention for implementation.

The readiness of paediatric nurses in hospitals to implement VRD in pain management is an essential factor in successfully using a health technology. Based on the study's results, the readiness of nurses to use VRD, as seen from the readiness dimension, showed a good average. This is an initial step towards successfully implementing VRD in the paediatric ward as pain management for children. International studies have reported that nurses' readiness and positive attitudes toward VRD are critical determinants of its successful integration in paediatric units (Guerra-Armas *et al.*, 2023; Jones *et al.*, 2016). However, these findings come mainly from contexts with advanced technological infrastructures. In contrast, this study highlights that even in a low-resource healthcare system like Indonesia, nurses demonstrate similar openness and perceived usefulness of VRD, suggesting cultural and contextual adaptability of the intervention. Nurses who think or believe that EBN can improve the quality of nursing care are likely to use it, and vice versa. In addition, if nurses feel that there are too many other pressures or are unsure and need more clarification about the benefits of the research results, they are less likely to follow the results when caring for individual patients.

Nurses' readiness to use VRD in childcare in hospitals must be improved, and their knowledge and competence in using it must be improved. VRD is a non-pharmacological strategy that is useful in the treatment and care of paediatric patients. It can be considered an effective distraction technique for pain management in children and adolescents during venipuncture (Amallia, 2020). In addition, VRD can generate positive emotions more than traditional distraction techniques. Thus, nurses do not only provide pharmacological techniques to reduce pain in children. This aligns with studies from other countries showing that VRD effectively reduces procedural pain, anxiety, and distress among children (Gao *et al.*, 2023; Wong & Choi, 2023), but the current findings add new evidence from a Southeast Asian context where digital readiness among nurses is still emerging.

Implementing virtual reality technology, which is currently trending and used in various countries, is valuable for patient care. However, in the application of virtual reality in this hospital setting, it is necessary to

consider the level of nurse skills in implementing it and the burden of nurses that affects its application. The hope is that if the practice is to change significantly and sustainably, the first thing that must be considered is the attitude and perception of nurses towards VRD as a nursing care intervention because both can be said to have the most significant influence on behaviour. International comparisons show that training and workload are persistent barriers to VRD implementation globally (Jeong & Lee, 2019), but this study extends that understanding by highlighting how these factors intersect with the limited infrastructure and policy support in Indonesian hospitals.

Virtual reality (VR) is becoming increasingly popular in healthcare delivery and health education (Jeong & Lee, 2019), but virtual reality is still minimal in Indonesia. The study findings showed that nurses perceived VRD as a new technology and needed to become more familiar with this intervention. Moreover, several studies have also found that virtual reality technology, as a distraction technique for pain management (Guerra-Armas *et al.*, 2023; Jones *et al.*, 2016), still needs to be improved. Compared with findings from high-income countries where nurses show greater confidence in technology-based care delivery, this study reveals that Indonesian nurses' cautious optimism reflects both enthusiasm and systemic limitations – creating a contrast that underlines the novelty of this study's context. Nurses are increasingly required to integrate technology into their services. A study on telenursing training found that only 6.7% of nurses initially exhibited a high level of readiness, but this increased to 66.7% following the training. Evaluations indicated that 46.7% fell into the excellent category, demonstrating the training's effectiveness (Dias, 2023). Therefore, the preparedness of nurses to use VRD will improve further with targeted training for paediatric nurses.

Nurses' perceptions regarding their unfamiliarity with virtual reality distractions can occur due to limited knowledge about this information, and the infrastructure regarding virtual reality in hospitals has yet to be widely prepared (Twamley *et al.*, 2024). One study revealed that negative perceptions are due to the lack of exposure of nurses to virtual reality, the availability of facilities, technological constraints, such as using hand controllers, and physical discomfort (Lau *et al.*, 2023). This resonates with reports from other low- and middle-income settings where digital health innovations face challenges of accessibility, cost, and maintenance. However, this study adds a new layer of understanding by revealing that despite these barriers, Indonesian nurses remain receptive to adopting VRD – indicating potential for early implementation if institutional support follows. Nurses who perceive VRD as something unfamiliar will be reluctant to use it, even though this technology benefits patients.

Nurses' perceptions about using virtual reality as a pain management method in paediatrics are influenced by the appropriateness of the child's age for using this technology. The study findings indicate that paediatric nurses believe VRD suits school-age children and adolescents more. Almost all nurses reported that they had yet to seek out research results related to the effectiveness of VRD in pain management. VRD is considered more effective than traditional distraction methods because its immersive nature allows patients to actively interact with a vivid virtual environment, which is the theory that it demands more attention (Khajehpour *et al.*, 2024). This level of interaction requires more attention, enhancing its effectiveness in pain management. International findings have similarly shown that VRD is most effective among children aged six years and older (Ugras *et al.*, 2023; Wong & Choi, 2023), and this study's local confirmation strengthens the cross-cultural validity of those age-related recommendations.

According to the nurses, VRD appears to be useful for pain management, especially when considering the child's age, for example, over the age of ten. Nurses feel that the VRD tools will be complex for children over ten years old. Most VR manufacturers do not recommend VR use in children under 13 due to their neurodevelopmental characteristics (Araiza-Alba *et al.*, 2022; Chen *et al.*, 2024). Children under six will also experience proper eye distance adjustment when using virtual reality devices (Saraswati & Hariyati, 2022). A study has shown that virtual reality effectively reduces pain in children over six years old (Bahrololoomi *et al.*, 2024). However, it is not recommended for children under six, as their optic nerve development has yet to adapt to the distances required for virtual reality (Bexson *et al.*, 2024). However, other studies say that VRD can be done on children aged four years. Virtual reality significantly reduces pain during dressing changes and can increase clinical efficiency by reducing the time required for each dressing change; in addition, virtual distractions minimise pain and make nurses more cooperative and calmer when changing dressings (Hua *et al.*, 2015; Ugras *et al.*, 2023). These parallels between international findings and this Indonesian study underscore

that nurses' clinical judgement regarding developmental appropriateness is consistent across settings, reinforcing the universality of age considerations in VRD implementation.

Nurses have expressed concern regarding selecting virtual reality films used in VRD interventions to alleviate paediatric pain. It is widely agreed that the choice of cinema should be age-appropriate and tailored to each child, as there needs to be more than a one-size-fits-all approach. A more subdued and gentle approach to the visuals and sounds is recommended for older children. In comparison, younger children may benefit from more engaging shows (Shetty *et al.*, 2019), such as children's cartoon shows Tom and Jerry, Shinchon, Cota Bhon, and Ben 10. In addition, 3D (three-dimensional) applications regarding virtual reality aquariums with baby shark shows are considered appropriate for children (Aydm & Özyazıcıoğlu, 2019).

In principle, VRD can use any film, but it should be appropriate for the child's age and something the child enjoys (Trudeau *et al.*, 2023). If a child does not like the type of film used in VRD, it will affect how much the distraction reduces the child's pain. Providing distraction techniques to postoperative children, such as watching cartoons, has been proven highly effective in reducing children's pain (Rahayu, 2020). Cartoon videos incorporate sound, images, colours, stories, and emotions such as happiness, sadness, excitement, and enthusiasm, which stimulate the right lobes of the brain. Simultaneously, the sound in cartoon videos can also stimulate the left lobes of the brain. This combination impacts the balance of brain function, helping children to become more focused and potentially diverting their attention from pain. Using various devices, including virtual reality, can effectively distract children from pain during procedures like IV drips and venipuncture (Gao *et al.*, 2023; Wong & Choi, 2023).

This intervention can quickly divert the child's attention from the pain associated with the procedure. The video chosen for the child should be tailored to their age and interests, and it can be used for children starting at two years old. This video-viewing intervention can be implemented a few minutes before, during, and for several minutes afterward until the procedure is completed. In the past, it was mentioned that nurses viewed VRD as an innovative healthcare delivery technology. However, VRD facilities are not widely accessible in hospitals, particularly in Bandung City, Indonesia. Therefore, it is recommended that hospitals incorporate virtual reality facilities for nurses. Hospitals that have implemented VRD for managing children's pain should also offer training on using virtual reality as a distraction technique for paediatric pain management. Such recommendations mirror international best practices but carry unique relevance in Indonesia, where this study serves as an early empirical foundation to guide policy and infrastructure development for digital-based nursing interventions.

While this study primarily assessed nurses' readiness and perceptions, its broader significance lies in the potential to improve paediatric pain management outcomes. Enhanced nurse readiness – cognitively, affectively, and behaviourally – can lead to more consistent and effective use of non-pharmacological interventions such as Virtual Reality Distraction (VRD). This, in turn, is expected to reduce pain intensity, anxiety, and distress in children during medical procedures. Although patient outcomes were not directly measured in this study, the findings lay an important foundation for future research to quantify the impact of improved nurse readiness on measurable paediatric pain outcomes, thus supporting a more patient-centred approach to care. By contrasting these results with global evidence, this study's contribution lies in demonstrating that nurses' technological readiness in an Indonesian context is emerging as a critical enabler for translating international evidence into local practice – establishing its novelty as one of the first empirical studies on VRD readiness in Southeast Asia.

Limitations

The study acknowledges the limitation of a small sample size and data collection from a single hospital, which may affect the generalisability of the findings. To address this limitation, future research is recommended to involve a larger sample across multiple healthcare settings or hospitals, allowing for broader representation and more diverse perspectives. A multi-site, larger-scale study would not only enhance the external validity of the results but also provide deeper insights into variations in nurse readiness and perceptions across different institutional contexts.

CONCLUSION

With the increasing complexity of paediatric care, virtual reality technology presents a promising, non-pharmacological approach to enhancing nursing interventions, particularly in managing pain. This study found that nurses demonstrate moderate levels of cognitive, affective, and behavioural readiness to implement Virtual Reality Distraction (VRD) in paediatric settings. Their willingness to use VRD and belief in its effectiveness reflect a foundation for integrating such technology into routine care. However, nurses also consider key contextual factors, including the child's age suitability, the importance of age-appropriate VRD content, and the need for proper training and infrastructure. These findings highlight that readiness alone is not sufficient; successful implementation depends on addressing practical barriers. Given the study's limitations, such as a small sample size and single-site data collection, these results should be viewed as preliminary. Broader, multi-site studies are recommended to validate these insights and inform scalable implementation strategies. To enhance paediatric pain management, hospitals should prioritise the training of nurses and the integration of VRD into standard nursing care. Establishing evidence-based guidelines, providing access to appropriate technology, and promoting interdisciplinary collaboration are essential steps toward leveraging VRD as a routine, effective component of paediatric nursing practice.

Recommendation

To ensure the effective integration of Virtual Reality Distraction (VRD) into paediatric nursing practice, hospitals and healthcare systems should establish standardised, evidence-based guidelines informed by ongoing research and quality improvement initiatives. Policies must emphasise cost-effective and age-appropriate technologies to enhance accessibility, particularly in resource-limited settings. Structured training and continuing education programmes are needed to strengthen nurses' technical and clinical competencies, supported by adequate infrastructure, device maintenance, and reliable connectivity. Interdisciplinary collaboration among nurses, paediatricians, psychologists, and technology experts should be fostered to design culturally relevant interventions, while routine monitoring and evaluation will provide data-driven insights to guide sustainable implementation. These measures collectively position VRD as a reliable, affordable, and scalable innovation for improving paediatric pain management.

Conflict of Interest

The authors declare that they have no competing interests.

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