



THE EFFECT OF VIRTUAL REALITY (VR) INTERVENTION ON ANXIETY LEVELS AND QUALITY OF LIFE IN PREOPERATIVE PATIENTS UNDERGOING SPINAL ANESTHESIA

Ica Lisnawati^{1*}, Noor Khalilati¹, Candra Kusuma Negara²

¹Department of Anesthesiology Nursing, Universitas Muhammadiyah Banjarmasin, Jl. S. Parman Kompleks RS Islam, Ps. Lama, Banjarmasin Tengah, Banjarmasin, South Kalimantan 70116, Indonesia

²Faculty of Medicine and Health Science, Universitas Lambung Mangkurat, Jl. Brigjend H. Hasan Basri, Pangeran, Banjarmasin Utara, Banjarmasin, South Kalimantan 70123, Indonesia

*Icha.ners06@gmail.com

ABSTRACT

Preoperative anxiety is a common psychological condition that can negatively affect patients' physiological responses and decrease their quality of life. Patients undergoing spinal anesthesia are particularly vulnerable, as they remain conscious throughout the procedure. Non-pharmacological interventions such as Virtual Reality (VR) offer an innovative approach to reducing anxiety; however, evidence of its effectiveness in regional hospital settings remains limited. This study aimed to examine the effect of Virtual Reality intervention on anxiety levels and quality of life among preoperative patients undergoing spinal anesthesia at Banjarmasin Regional General Hospital. A quasi-experimental design with a non-equivalent control group was employed. The sample consisted of 30 patients purposively divided into two groups: 15 in the intervention group and 15 in the control group. The intervention group received VR exposure for 20 minutes prior to surgery, while the control group received standard care. The instruments used were the Amsterdam Preoperative Anxiety and Information Scale (APAIS) and the Short Form-36 (SF-36) questionnaire. Data were analyzed using the Mann-Whitney and Wilcoxon Signed-Rank tests. Before the intervention, there were no significant differences between the intervention and control groups in anxiety scores ($p = 0.614$) or quality of life scores ($p = 0.791$). After the intervention, the intervention group showed a significant reduction in anxiety scores (13.8 ± 2.7) compared to the control group (20.1 ± 2.6) with a p -value of 0.004. A significant improvement was also observed in the quality of life scores of the intervention group (73.1 ± 6.4) compared to the control group (60.2 ± 7.3) with a p -value of 0.007. Virtual Reality intervention was effective in reducing anxiety and improving the quality of life of preoperative patients undergoing spinal anesthesia. VR has the potential to serve as a practical, efficient, and feasible non-pharmacological intervention in healthcare settings.

Keywords: anxiety; preoperative; quality of life; spinal anesthesia; virtual reality

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INTRODUCTION

Preoperative anxiety is a common psychological condition that often receives insufficient attention during the perioperative process. This anxiety arises as a response to uncertainty, fear of surgical procedures, anesthesia, pain, and the possibility of complications (Wang et al., 2022). It affects not only the patient's emotional comfort but also has a direct physiological impact, such as increasing blood pressure, heart rate, and systemic vascular resistance, which may worsen the patient's condition before and during surgery (Oliveira et al., 2022). Preoperative anxiety is reported to affect 60% to 80% of adult patients globally, with variations depending on the type of surgery, age, gender, prior surgical experience, and the patient's mental and social health status (Aktaş & İlgin, 2023). In Indonesia, the prevalence of preoperative anxiety reaches 70–85% according to various hospital-based studies, particularly among patients undergoing spinal anesthesia, where patients remain conscious throughout the surgical procedure (Nimmaanrat et al., 2023; Saputra et al., 2024). This makes spinal

anesthesia a specific psychological challenge, as patients become more sensitive to environmental stimuli in the operating room, including the sound of medical equipment and conversations among the surgical team (Eberhart et al., 2020).

Preliminary data from Banjarmasin Regional General Hospital (RSUD Banjarmasin) show that more than 75% of preoperative patients experience moderate to severe anxiety, affecting hemodynamic stability and slowing postoperative recovery. Such anxiety contributes to increased need for intraoperative pharmacotherapy, psychosomatic complications, and a decline in the patient's quality of life both before and after surgery (Chiu et al., 2023). Conventional efforts to reduce preoperative anxiety include preoperative education, deep breathing exercises, relaxation techniques, and the use of anxiolytic drugs such as diazepam or pregabalin (Cahyanti et al., 2020; Noor, 2019). However, pharmacological approaches often cause side effects such as excessive drowsiness, dizziness, and short-term memory impairment. Meanwhile, traditional non-pharmacological interventions, such as verbal education or counseling, have limited effectiveness as they rely heavily on an individual's capacity to absorb and internalize information within a short time (Yılmaz et al., 2024).

With the advancement of digital technology in healthcare, Virtual Reality (VR) has emerged as a promising innovative intervention for managing preoperative anxiety. VR is an immersive visual medium that enables patients to be "transported" into a calm, controlled virtual environment. Several international studies have demonstrated the effectiveness of VR in reducing anxiety levels through mechanisms of distraction and physiological relaxation (Abbas et al., 2023a; Damaiyanti et al., 2024). This technology is not only safe due to the absence of physical side effects but also offers a deep and personalized sensory experience. Other research found that a 15–20-minute VR intervention significantly reduced preoperative anxiety scores among patients undergoing elective surgery under general anesthesia compared to those who received only conventional education (Chiu et al., 2023). Another study by (Abbas et al., 2023a) reported that VR not only reduced anxiety but also improved patients' perceptions of self-control and comfort before surgery. However, most VR-related preoperative studies have been conducted in high-resource countries, and rarely focus on patients undergoing spinal anesthesia, who exhibit distinct psychological characteristics due to retained consciousness during the procedure. Evidence on the effectiveness of VR in regional hospital settings with limited resources, such as RSUD Banjarmasin, remains scarce.

Additionally, this study incorporates Quality of Life (QoL) as a critical outcome measure. High levels of preoperative anxiety can not only have short-term impacts but also significantly reduce QoL across physical, psychological, social, and environmental domains. Therefore, evaluating the impact of VR on QoL offers a comprehensive understanding of its benefits from both clinical and holistic care perspectives. Based on this background, this study aims to analyze the effect of Virtual Reality intervention on anxiety levels and quality of life among preoperative patients undergoing spinal anesthesia at RSUD Banjarmasin. The findings are expected to provide scientific evidence for the development of effective, safe, and applicable anxiety management protocols using technology-based interventions in resource-limited healthcare settings.

METHOD

This study employed a quasi-experimental design with a non-equivalent control group design, consisting of two groups: an intervention group receiving Virtual Reality (VR) treatment and a control group receiving standard care. This design was chosen to compare the effects of VR on anxiety levels and quality of life in preoperative patients undergoing spinal anesthesia, although full randomization was not conducted. The approach allowed for the evaluation of

changes within the intervention group before and after the treatment, as well as comparisons between the two groups. The study was conducted at RSUD Banjarmasin, specifically in the preoperative preparation room. This hospital was selected because it is a regional referral center with a high volume of elective surgeries using spinal anesthesia. The target population consisted of all adult patients scheduled for elective surgery with spinal anesthesia during the study period.

Inclusion criteria included patients aged 18–60 years, with stable physical condition (ASA I–II), able to communicate verbally and visually, and willing to participate by signing informed consent. Exclusion criteria included patients with severe visual or hearing impairments, a history of epilepsy or neurological disorders, acute severe pain, or unstable psychological conditions. A purposive sampling technique was used to select participants based on specific criteria relevant to the research objectives. A total of 30 patients were included and equally divided into two groups: 15 in the intervention group and 15 in the control group. All participants completed two questionnaires in the pretest phase: the Amsterdam Preoperative Anxiety and Information Scale (APAIS) to measure anxiety and the Short Form-36 (SF-36) to assess quality of life. The APAIS and SF-36 instruments had previously undergone validity testing with Pearson's correlation ($r > 0.30$ for all items) and demonstrated high reliability with Cronbach's alpha coefficients of 0.82 and 0.88, respectively.

Following the pretest, participants in the intervention group underwent a 20-minute VR session approximately one hour prior to surgery. The intervention took place in a quiet and comfortable preoperative waiting area. Participants were instructed to sit comfortably and wear a VR headset connected to a smartphone displaying immersive VR content. The content included nature scenes such as forests, beaches, and rivers, accompanied by natural sounds (e.g., birdsong, flowing water), and guided breathing exercises. This content was designed to induce distraction and relaxation, helping shift patients' focus away from surgical fear. A healthcare staff member monitored each session to ensure comfort and safety.

In contrast, the control group received only standard hospital care, which included vital sign monitoring and brief education about the surgical procedure by medical staff. No additional intervention such as technology or relaxation media was provided. After the intervention (or after a comparable waiting period for the control group), all participants completed the APAIS and SF-36 questionnaires again as a posttest. The collected data were analyzed using appropriate statistical tests. Univariate analysis was used to describe the demographic characteristics of respondents, such as age, gender, and education level. Bivariate analysis was conducted to evaluate the effects of the intervention on the dependent variables. The Mann-Whitney test was used to compare anxiety and quality of life scores between the intervention and control groups. The Wilcoxon Signed-Rank test was used to assess pre-post changes within the intervention group. All analyses were performed at a 95% significance level ($p < 0.05$).

RESULT

Respondent Characteristics

Table 1 presents the distribution of demographic characteristics among respondents in both the intervention and control groups. The majority of respondents in both groups were female (63.3%), while males accounted for 36.7%. In terms of age distribution, the largest proportion of participants fell within the 31–45 years age group (43.3%), followed by those aged 46–60 years (40%), and the 18–30 years age group (16.7%). Regarding education level, most respondents had completed secondary education (high school) (43.3%), followed by higher education (26.7%), primary school (16.7%), and junior high school (13.3%). Overall, the

demographic characteristics between the intervention and control groups were well balanced in terms of gender, age, and educational background. This indicates that both groups had comparable baseline profiles, making them suitable for a valid comparison of intervention effects.

Table 1.
Respondent Characteristics (n=30)

No	Characteristic	Category	Intervention Group (n=15)	Control Group (n=15)	Total (n=30)
1	Gender	Male	6 (40%)	5 (33.3%)	11 (36.7%)
		Female	9 (60%)	10 (66.7%)	19 (63.3%)
2	Age (years)	18-30	3 (20%)	2 (13.3%)	5 (16.7%)
		31-45	6 (40%)	7 (46.7%)	13 (43.3%)
		46-60	6 (40%)	6 (40%)	12 (40%)
3	Education Level	Primary School	2 (13.3%)	3 (20%)	5 (36.7%)
		Junior High School	2 (13.3%)	2 (13.3%)	4 (13.3%)
		Senior High School	7 (46.7%)	6 (40%)	13 (43.3%)
		Higher Education	4 (26.7%)	4 (26.7%)	8 (26.7%)

Comparison of Anxiety Level (APAIS) and Quality of Life (SF-36) Scores Before and After the Intervention

Table 2.
Comparison of Anxiety Level (APAIS) and Quality of Life (SF-36) Scores Before and After the Intervention (n = 15 per group)

Variable	Time	Intervention Group (Mean±SD)	Control Group (Mean±SD)	p-value*
Anxiety Level (APAIS)	Before	21.4±2.9	20.9±3.1	0.614
	After	13.8±2.7	20.1±2.6	0.004
Quality of Life (SF-36)	Before	59.3±7.8	58.7±8.1	0.791
	After	73.1±6.4	60.2±7.3	0.007

*Mann-Whitney test was used to compare the intervention and control groups at each time point (pretest and posttest).

APAIS scale: 6–30 (higher scores indicate greater anxiety).

SF-36 scale: 0–100 (higher scores indicate better quality of life).

Table 2, prior to the intervention, the mean anxiety score in the intervention group was 21.4 ± 2.9 , while in the control group it was 20.9 ± 3.1 , with a p-value of 0.614. Similarly, the mean quality of life score (SF-36) was 59.3 ± 7.8 in the intervention group and 58.7 ± 8.1 in the control group, with a p-value of 0.791. These findings indicate that there were no statistically significant differences between the two groups before the intervention. After the intervention, the anxiety score in the intervention group decreased significantly to 13.8 ± 2.7 , whereas the control group remained high at 20.1 ± 2.6 . This difference was statistically significant ($p = 0.004$). Meanwhile, the quality of life score in the intervention group improved to 73.1 ± 6.4 , compared to 60.2 ± 7.3 in the control group, with a p-value of 0.007. These results indicate that the Virtual Reality intervention was significantly effective in reducing preoperative anxiety and improving the quality of life compared to standard care.

DISCUSSION

This study aimed to evaluate the effectiveness of Virtual Reality (VR) intervention in reducing anxiety levels and improving the quality of life of preoperative patients undergoing spinal anesthesia. The findings revealed a significant decrease in anxiety levels and a notable improvement in quality of life following the VR intervention in the intervention group compared to the control group, which only received standard care. Before the intervention, both groups had relatively similar baseline scores for anxiety and quality of life. The mean anxiety score in the intervention group was 21.4 ± 2.9 , compared to 20.9 ± 3.1 in the control group ($p = 0.614$). Likewise, the mean quality of life score (SF-36) prior to the intervention was 59.3 ± 7.8 in the intervention group and 58.7 ± 8.1 in the control group ($p = 0.791$). These non-significant p-values indicate that the initial distribution between the two groups was homogeneous, allowing for valid comparisons of intervention outcomes without external variable bias.

Following the intervention, the anxiety score in the intervention group significantly decreased to 13.8 ± 2.7 , while the control group remained high at 20.1 ± 2.6 ($p = 0.004$). The intervention group also experienced a significant improvement in quality of life, reaching a mean score of 73.1 ± 6.4 compared to 60.2 ± 7.3 in the control group ($p = 0.007$). These results indicate that VR provided a clear psychological benefit and enhanced patients' sense of well-being prior to surgery. These findings are consistent with those of (Chiu et al., 2023), who reported that VR interventions significantly reduced preoperative anxiety among adult patients undergoing elective surgery. VR offers an effective distraction by delivering calming visual and auditory stimuli, redirecting patients' attention from fear and tension associated with surgical procedures (Abbas et al., 2023b; Duncan, 2025; Muniyasamy et al., n.d.). This effect is achieved through activation of the brain's limbic system, which governs emotional regulation. Exposure to tranquil natural scenes and sounds helps suppress sympathetic nervous system responses, leading to reduced levels of stress hormones such as cortisol and adrenaline (Arifputra et al., 2021).

The effectiveness of VR as a non-pharmacological intervention is further supported by a meta-analysis conducted by (Eberhart et al., 2020). which found that immersive media like VR was more effective in reducing anxiety scores than conventional verbal education or standard relaxation techniques. In the context of spinal anesthesia, this intervention is particularly relevant as patients remain conscious throughout the procedure, making them more vulnerable to anxiety induced by environmental stimuli in the operating room (Amirthanayagam et al., 2024; Bozych et al., 2024).

Beyond reducing anxiety, this study also demonstrated that VR interventions can significantly improve overall quality of life. This is reflected in the improved SF-36 scores, which encompass domains such as physical health, social functioning, psychological well-being, and vitality. (Pei et al., 2023) reported similar findings, showing that VR not only alleviated pain and anxiety but also enhanced patients' self-control and confidence in the medical process, which ultimately elevated their perception of quality of life.

The improvement in post-intervention quality of life observed in this study may be attributed to three main factors. First, VR provides a soothing and enjoyable personal experience (Riches et al., 2021). Second, it gives patients a sense of control over uncertain medical situations, contributing to stress reduction (Nijland et al., 2021). Third, the relaxation induced by VR helps improve emotional well-being, indirectly enhancing patients' perceptions of their physical and social functioning (Solem et al., 2021).

A key strength of this study lies in the implementation of VR intervention in a regional hospital setting with limited resources. This demonstrates that simple yet targeted VR technology can be applied effectively in healthcare facilities lacking advanced infrastructure. Using only a VR headset and smartphone, patients were able to experience significant psychological benefits without requiring additional pharmacological therapy. Nevertheless, this study has certain limitations. The relatively small sample size ($n = 30$) restricts the generalizability of the findings to a broader population. Additionally, the short follow-up period prevents the assessment of long-term effects of the intervention. Future research with larger samples, extended observation periods, and mixed-methods approaches (quantitative and qualitative) would be valuable in validating these findings and exploring patients' subjective experiences with VR more deeply.

Moreover, the diverse educational backgrounds of respondents may influence their acceptance and understanding of VR technology. In this study, the majority of participants had completed high school (43.3%), followed by university graduates (26.7%), primary school (16.7%), and junior high school (13.3%). Although this study did not conduct stratified analysis by education level, such variations should be considered when developing VR intervention guidelines tailored to patients' comprehension levels and needs. From a clinical standpoint, these findings can serve as a foundation for recommending VR use as part of standard preoperative protocols, particularly for patients undergoing spinal anesthesia. In addition to effectively reducing anxiety, this approach avoids physical side effects associated with anxiolytic medications. Integrating VR aligns with modern nursing practice, which emphasizes holistic, humanistic, and technology-driven care models.

Overall, this study contributes important insights to the fields of perioperative nursing and healthcare technology. With its simple yet effective application, Virtual Reality represents an innovative approach that offers both psychological and functional benefits to patients. This research reinforces the evidence that immersive, non-pharmacological methods can produce significant clinical outcomes by improving patients' mental preparedness and quality of life prior to surgery. This study aimed to evaluate the effectiveness of Virtual Reality (VR) intervention in reducing anxiety levels and improving the quality of life of preoperative patients undergoing spinal anesthesia. The findings revealed a significant decrease in anxiety levels and a notable improvement in quality of life following the VR intervention in the intervention group compared to the control group, which only received standard care.

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reinforces the evidence that immersive, non-pharmacological methods can produce significant clinical outcomes by improving patients' mental preparedness and quality of life prior to surgery.

CONCLUSION

This study demonstrates that Virtual Reality (VR) intervention is effective in reducing anxiety levels and improving the quality of life of preoperative patients undergoing spinal anesthesia. There was a statistically significant reduction in anxiety scores and a meaningful increase in quality of life scores following VR intervention compared to the control group receiving standard care. VR provided deep visual and sensory distraction, helping to mitigate patients' negative emotional responses toward surgical procedures. These results indicate that VR can serve as a safe, practical, and efficient non-pharmacological strategy for managing preoperative anxiety, particularly in healthcare settings with limited resources. VR also supports a holistic nursing approach that prioritizes patients' psychological comfort. Therefore, integrating VR technology into preoperative protocols is worth considering as an additional intervention to enhance patients' mental readiness and overall quality of life before surgery.

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