Original Article

Effectiveness of Guided Imagery Therapy in Reducing Pain Among Adult Post-Appendectomy Patients: A Quasi-Experimental Study

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ABSTRACT

Background: Pain is a common complaint among postoperative patients, including those undergoing appendectomy. Guided imagery therapy is a non-pharmacological intervention that can help reduce pain by diverting patients' attention from discomfort with minimal side effects. However, evidence regarding its effectiveness in adult post-appendectomy patients remains limited. This study aimed to determine the effect of guided imagery therapy on reducing pain intensity in adult post-appendectomy patients.
Methods: This study used a quasi-experimental design with a pretest-posttest control group, conducted in accordance with the TREND reporting guidelines. This study received ethical approval from the Research Ethics Committee of the Karsa Husada Garut College of Health Sciences. The sample consisted of 50 patients, equally divided into intervention and control groups (25 per group), recruited according to the inclusion and exclusion criteria. The independent variable was guided imagery therapy administered twice a day for 15–20 minutes over three consecutive days by the researcher, while the dependent variable was pain intensity measured using the Numeric Rating Scale (NRS). The control group received routine care. Data were analyzed using the Mann-Whitney test for differences between groups, with a significance level of 0.05. All statistical analyses were performed using IBM SPSS Statistics version 29.
Results: The intervention group showed a significant reduction in pain intensity ($p<0.05$). The intervention group demonstrated a marked reduction in mean pain scores from 4.88 at pretest to 1.68 at posttest, representing a very large within-group effect. In contrast, the control group showed only a minimal change from 4.84 to 4.44. Between-group comparison indicated a significantly greater reduction in pain in the intervention group than in the control group. All main statistical results are presented with 95% confidence intervals to provide an estimate of precision and uncertainty around the observed effects.
Conclusion: Guided imagery therapy has been shown to significantly reduce pain intensity in adult patients after appendectomy compared to the control group. It is recommended that nurses teach and provide guided imagery therapy regularly to reduce pain intensity in adult post-appendectomy patients

Keywords: Guided Imagery; Pain Management; Appendectomy Patients; Postoperative Pain; Complementary Therapies.

Implications for Practice:

- Guided imagery therapy may be incorporated into routine postoperative care as a safe and effective complementary intervention to support pain management in adult post-appendectomy patients.
- Healthcare institutions and policymakers should consider developing evidence-informed protocols and implementation strategies to facilitate the integration of guided imagery into postoperative pain management services.
- Midwifery and nursing education programs should strengthen training in non-pharmacological pain management approaches, particularly guided imagery, given its feasibility and low-cost application in resource-constrained settings and Low-and Middle-Income Countries.

Introduction

A low-fiber diet, high consumption of fast food, and an unhealthy lifestyle are major contributing factors to digestive disorders. One impact is the increase in cases of gastrointestinal diseases, including appendicitis. Appendicitis, an inflammation of the appendix, is one of the most common acute abdominal conditions requiring surgery (Alsharari et al., 2023; Dixon & Singh, 2023). This inflammation can occur due to several factors, including lymphatic hyperplasia, appendix tumors, ascaris worms that block the appendix, and fecaliths (Biput et al., 2024; Niang et al., 2022).

According to Global Burden of Disease (GBD) data from 2021, the number of new cases of appendicitis is estimated to reach 17.0 million—with a mortality rate of 29.300, with a higher incidence in men than in women. The study reported that the incidence of appendicitis is higher in high-income countries, while mortality rates from appendicitis tend to be higher in low-income countries. High-income countries tend to have higher but relatively stable rates of appendicitis, while developing countries show a trend of increasing incidence of appendicitis accompanied by limited access to quality healthcare. Research has found that most patients with appendicitis presenting to hospitals in low- and middle-income countries experience prolonged pre-hospital delays. In Andean Latin America, composed of three countries (Bolivia, Ecuador, and Peru), has one of the highest incidence and mortality rates across all GBD regions–however, this region also had the biggest success in reducing the disease burden during the study period (Han et al., 2024). These findings indicate that appendicitis remains a global health problem with varying distributions of incidence and impacts across regions.

In Indonesia, cases of appendicitis in 2021 reached 463.000, with a death rate of 1.220 (Han et al., 2024). In 2013, there were 5,980 cases of appendicitis in West Java, and 177 of these cases resulted in death (Dillah et al., 2025). Based on medical records from dr. Slamet Garut Regional Hospital, the incidence of appendicitis from January to December 2024 was 273, with 228 of these patients undergoing appendectomy. Furthermore, in the Agate Bawah Ward, 18 patients underwent post-appendectomy care within the past month.

Patients with appendicitis commonly undergo an appendectomy, a surgical procedure to remove the infected appendix. This procedure can compromise the patient's integrity and trigger a pain response, posing an unavoidable clinical challenge (Zhang et al., 2026). Almost all surgeries result in pain (Baldor et al., 2022). If postoperative pain is not managed properly, the risk of complications can increase up to two-fold, resulting in a longer recovery process, and the patient's quality of life can be significantly affected. (Kubulus et al., 2025).

Pain management can be achieved through two main approaches: pharmacological and non-pharmacological. Pharmacological approaches involve the use of analgesic medications to reduce pain, while non-pharmacological approaches involve pain management efforts without the use of medication. Gate Control Theory explains that pain is the result of a dynamic interaction between nerve signals and modulation in the spinal cord and brain, allowing the experience of pain to be influenced by both physiological and psychological factors. This theory suggests that pain can be modulated through sensory stimulation and psychological factors, thus opening up the possibility of various non-pharmacological therapies for pain reduction (Moayedi & Davis, 2013).

One non-pharmacological pain management approach that is starting to be widely used is guided imagery therapy (Felix et al., 2019). This method utilizes the senses of sight, touch, hearing, smell, taste, and imagination to reduce pain by optimizing the response of the sympathetic nervous system. Guided imagery is a relaxation technique that involves the use of guided imagery to create calming and positive mental images. This therapy works by diverting the patient's attention from the pain they are experiencing and helping the body achieve a relaxed state, thereby reducing the pain response. By increasing body relaxation, guided imagery helps reduce pain perception through mechanisms that influence how the brain and body respond to pain (Pappas et al., 2024).

Various studies have demonstrated the effectiveness of guided imagery therapy in reducing postoperative pain in various types of surgical procedures. A systematic review conducted by (Pappas et al., 2024) reported that guided imagery is a safe and potentially effective intervention in reducing pain intensity, anxiety, and improving patient comfort during the perioperative period. These findings suggest that the benefits of guided imagery are not limited to one specific type of surgery but can be applied broadly to postoperative patients.

Guided imagery therapy may help reduce pain intensity in post-appendectomy patients because this technique can trigger a psychophysiological response that reduces sympathetic nervous system activity, which plays a role in pain perception. Furthermore, activation of brain areas associated with relaxation and positive emotions can inhibit pain processing centers in the brain, thereby reducing the intensity of pain experienced by patients (Burhenn et al., 2014). This is supported by research (Aghakhani et al., 2022) which states that guided imagery had a significant effect on reducing the severity and quality of pain. Guided imagery can be employed during or before a procedure to reduce pain, help induce relaxation, and has no significant risk (Pappas et al., 2024). Hence, this therapy relieves pain in postoperative patients.

In the abdominal surgery population, available evidence also shows promising results. A study by (Lu et al., 2022) in patients undergoing laparoscopic cholecystectomy found that guided imagery meditation had positive effects, including reduced anxiety, improved sleep quality, and decreased postoperative pain intensity compared to a control group. These findings suggest that guided imagery has the potential to be an effective non-pharmacological intervention for pain management in patients undergoing abdominal surgery. In the context of post-appendectomy patients, guided imagery therapy is expected to help reduce pain intensity, thereby increasing comfort and accelerating the recovery process. This technique can trigger a psychophysiological response that reduces sympathetic nervous system activity, which plays a role in pain perception.

However, previous research were not specifically conducted on adult post-appendectomy patients. To date, scientific evidence and the application of guided imagery therapy in adult post-appendectomy patients, both globally and in Indonesia, are still relatively limited and have not been widely developed in clinical nursing practice. In fact, this therapy can be a safe, easy-to-implement, and minimally side-effect non-pharmacological intervention to help reduce postoperative pain. Therefore, research on the effectiveness of guided imagery therapy is crucial to support the development of more innovative and effective non-pharmacological nursing interventions that can be implemented in various healthcare settings. Based on this, this study was conducted to determine the effect of guided imagery therapy on reducing pain intensity in adult post-appendectomy patients.

Methods

Study Design

This study used a quasi-experimental design with a pretest-posttest control group approach. The study was conducted over three consecutive days, with the intervention administered twice daily. This design allowed researchers to observe changes in pain intensity from the first to the last day in each group and to compare the magnitude of changes between the intervention and control groups. The quasi-experimental design was chosen due to limitations in conducting full randomization in postoperative patients in a clinical setting, considering ethical considerations, the patient's condition, and the care settings in the ward. Nevertheless, the study still used a control group to increase the validity of the results.

The group allocation procedure was carried out by dividing respondents who met the inclusion criteria into two groups: the intervention group receiving guided imagery therapy and the control group receiving standard hospital care. Before the intervention, all respondents underwent a pretest to assess their pain intensity using the NRS. The intervention group then received guided imagery therapy according to the study protocol, while the control group received only routine hospital procedures. After the intervention period, a repeat posttest was conducted to evaluate changes in pain intensity in both groups.

To mitigate potential bias due to non-random allocation, baseline characteristics of respondents in both groups were compared before the intervention. Equivalence of baseline characteristics was evaluated through a homogeneity analysis that included relevant demographic and clinical variables. Additionally, pre-test measurements were administered to all respondents to obtain a snapshot of each group's baseline condition before the intervention. The results of this analysis were used to assess the comparability of the groups and help strengthen the interpretation of the observed intervention effects.

Although various efforts have been made to improve group equivalence, quasi-experimental designs still have limitations compared to randomized controlled trials. Therefore, the causal relationship between guided imagery therapy and changes in pain intensity requires careful interpretation, taking into account the possibility of confounding factors that were not fully controlled for in this study.

In addition, a research flowchart is designed to systematically illustrate the research stages, from respondent selection, group assignment, intervention implementation, to data analysis, making it easier for readers to understand the study's implementation process. This study is reported in accordance with the Transparent Reporting of Evaluations with Nonrandomized Designs (TREND) guidelines (Des Jarlais et al., 2004).

Participants

The population consisted of all adult post-appendectomy patients in the Agate Bawah Ward at dr. Slamet Garut Regional Hospital of 228 people. The sample size was 50 patients–25 respondents for the intervention group and 25 respondents for the control group. The sample size was determined using purposive sampling technique. The sample size calculation used the sample size formula for two independent means (Clifton et al., 2018), with a standard deviation of α 5% (1.96), a standard deviation of β power test 95% (1.64), a standard deviation from previous research (6.747), and a difference in mean values from previous research (7.15). In addition, this study added a 10% margin to anticipate dropout. The analysis indicated that a minimum of 25 participants per group was required. Therefore, a total sample size of 50 participants was considered sufficient for this study.

The inclusion criteria were post-appendectomy patients being treated during the study period, male patients aged at least 18 years who were conscious and able to communicate, patients with moderate to mild pain and no serious postoperative complications, and willingness to participate throughout the study. The exclusion criteria were patients with postoperative laparoscopic appendectomy, having a history of severe chronic illness that could affect the response to therapy (e.g., kidney failure or cancer), being in critical condition or intensive care, and experiencing cognitive or mental impairment.

This study specifically included male patients to reduce sample heterogeneity and minimize the potential influence of biological factors that could influence pain perception. The literature indicates that pain experience is influenced by various biological, psychological, and social factors, including gender and hormonal factors. Differences in sex hormone levels, particularly estrogen and progesterone in women, have been reported to contribute to variations in pain sensitivity and response to pain management interventions (Fillingim et al., 2009; Mogil, 2020). Therefore, limiting the sample to male participants was carried out to obtain a more homogeneous study group and reduce potential variability unrelated to the intervention being studied.

This study used purposive sampling and non-random group allocation techniques, thus creating the potential for selection bias that could impact the study's internal validity. Furthermore, the possibility of unidentified confounding factors cannot be completely eliminated. Nevertheless, the use of uniform inclusion criteria, standardized intervention procedures, and consistent measurements across both groups were implemented to mitigate this potential bias.

Participant recruitment was conducted by trained research assistants in collaboration with nursing staff at the study site. All participants who were enrolled at baseline completed the study and were included in the final analysis. No participant withdrew, was lost to follow-up, or was excluded during the intervention period.

Instruments

Data were collected using two primary instruments, namely a SOPs for guided imagery therapy and a NRS pain observation sheet (Choi et al., 2024). The independent variable was guided imagery therapy, while the dependent variable was reduction in pain intensity in adult post-appendectomy patients, which was measured using the NRS. The SOPs for guided imagery in this study used the standards adopted by (Posadzki et al., 2012). NRS has demonstrated good validity and reliability for assessing pain intensity, supporting its use as a valid and reliable instrument for pain assessment. Previous studies have reported strong correlations between NRS scores and other validated pain measures, as well as acceptable test–retest reliability, supporting its use as a valid and reliable instrument for pain assessment in this population (Ferreira-Valente et al., 2011).

The SOPs included detailed steps for each stage of the procedure, from pre-interaction, self-preparation and equipment preparation, therapy implementation, and termination. Each stage serves as a guide for implementing guided imagery therapy. The NRS scale ranges from 0 to 10. Pain scores were categorized as 0 for no pain, mild (1–3), moderate (4–6), and severe (7–10) pain (Choi et al., 2024), consistent with commonly used clinical pain classification guidelines. The NRS was administered by researchers to participants, who were then instructed to indicate the number that best represented their perceived level of pain. These instruments facilitated accurate measurement of pain changes before and after the intervention. Observational forms were also used to document participant characteristics, pain intensity, and adherence to intervention procedures. Data collectors received standardized training to ensure consistent explanation and recording of pain scores. These instruments facilitated accurate measurement of pain changes before and after the intervention.

Intervention

Guided imagery is a non-pharmacological therapy technique that uses positive visualization or imagination and sensory stimulation, which has been shown to create relaxation, reduce pain, and calm physical and emotional conditions (Santana et al., 2023). In this technique, the patient is asked to imagine a natural scene such as an ocean, mountains, or grassland–and the patient is instructed to focus on the details of the imaginary scene that are seen and heard.

The intervention was administered directly by researchers who understood the procedures for implementing guided imagery therapy, based on SOPs developed prior to the study. Respondents were selected based on established inclusion and exclusion criteria, ensuring that all participants had characteristics consistent with the study's objectives. The intervention was carried out over three consecutive days, twice daily, with each session lasting approximately 15–20 minutes.

All guided imagery sessions were delivered using the same pre-recorded audio script and standardized intervention procedures. However, a formal fidelity checklist or independent fidelity assessment was not used; therefore, adherence to each intervention component was monitored through direct supervision by the researcher. The therapy implementation phase began with an explanation of the goals and procedures to the patient. The patient was then positioned as comfortably as possible in a semi-fowler's or supine position. Afterward, the patient was asked to close their eyes and perform slow breathing techniques to facilitate initial relaxation. Next, the researcher guided the patient to imagine a calm and comfortable natural setting while directing them to focus on the visual details, sounds, and positive sensations from the imagination (Posadzki et al., 2012). At the end of the session, the patient was slowly brought back to a conscious state and pain intensity were evaluated using the NRS.

To maintain intervention fidelity, all therapy sessions were conducted using the same procedures for each participant, including duration, frequency of administration, implementation stages, and the guided imagery script used. Researchers also conducted direct monitoring throughout the intervention to ensure that therapy was delivered consistently according to SOPs. Additionally, adverse events or discomfort during therapy, such as increased anxiety, physical discomfort, or discontinuation of therapy sessions, were monitored and recorded throughout the study.

The intervention was conducted in the Agate Bawah Ward of dr. Slamet Garut Regional Hospital in a conducive environment with minimal distractions. Before therapy began, the patient's surroundings were kept quiet, lighting was comfortable, and noise and activities that could disrupt concentration were minimized. All patients in the intervention group received guided imagery therapy consistently throughout the study period, while the control group received only routine hospital care without guided imagery therapy.

Data Collection

Data collection was conducted over a three consecutive days, twice a day in Agate Bawah Ward at dr. Slamet Garut Regional Hospital, West Java Province, Indonesia. Participant recruitment was conducted by research assistants in collaboration with nursing staff at the study site. Potential participants were approached in person during routine care hours and screened based on predetermined inclusion and exclusion criteria. Eligible participants received a clear explanation of the study's purpose, procedures, and benefits. If willing to be a respondent, patients were asked to fill out an informed consent form.

Prior to data collection, all enumerators received training on research procedures, instrument use, and ethical aspects of research to ensure a shared understanding of data collection techniques. Consistency between assessors was also evaluated during the training through hands-on practice supervised by the researchers. The data collection process was carried out systematically, starting with respondent selection, obtaining informed consent, pretesting, administering the intervention, and post-intervention evaluation. After respondents agreed to participate in the study, they were divided into intervention and control groups according to the study procedures. Subsequently, initial pain assessments were conducted using the NRS under standardized conditions before the intervention. The intervention group received guided imagery therapy according to a predetermined protocol, while the control group received routine hospital care.

To maintain data quality, researchers conducted direct supervision during the data collection process, routinely checked the completeness of the forms, and periodically verified the data to minimize recording errors. All data was recorded using a uniform documentation format and stored in a password-protected electronic database to maintain respondent confidentiality. Throughout the study period, compliance with intervention procedures and potential adverse effects were continuously monitored and documented by the research team. Post-intervention pain assessments were conducted using the same NRS instrument with uniform measurement procedures for both groups. All measurements were conducted by the same personnel at predetermined times to reduce measurement variation and enhance the study's internal validity. Incomplete data was minimized through direct checking after form completion, and any missing data was immediately clarified with respondents in accordance with established data management protocols.

Data Analysis

Data analysis began with descriptive statistics to describe respondent characteristics and pain intensity scores. Data are presented in the form of frequency distributions, percentages, means, medians, standard deviations, and minimum and maximum values in tabular form. All statistical analyses were conducted using IBM SPSS Statistics version 29. Pain intensity was measured using the NRS, which includes ratio data. All key statistical results are presented with 95% confidence intervals to provide an overview of the precision and uncertainty of the observed effects. Before conducting bivariate analysis, data normality was tested using the Kolmogorov-Smirnov test to determine the distribution of the research data. The test results indicated that the data were not normally distributed, so the analysis continued using the nonparametric Mann-Whitney test (Emerson, 2023).

Bivariate analysis was used to determine the difference between guided imagery therapy and patient pain intensity. Changes in pain intensity were calculated for each respondent to assess the level of pain reduction over the study period. Statistical significance was determined using an alpha level of 0.05, allowing for a more accurate evaluation of the effectiveness of the guided imagery therapy intervention. Missing data was minimized by directly checking the completeness of the forms after the data entry process. If incomplete data was found, the researcher immediately sought clarification from the respondents during data collection. If the data remained incomplete, the case was recorded and managed according to established research data management protocols before analysis began.

Ethical Considerations

This study received ethical approval from the Research Ethics Committee of the Karsa Husada Garut College of Health Sciences, with Ethical Approval Number 00208/KEPSTIKes Karsa Husada Garut/2025. This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki (World Medical Association, 2013) All participants received a clear explanation of the study's purpose, procedures, and benefits. Each patient signed a written consent form as a sign of their willingness to participate in the study. Participant confidentiality was maintained by assigning unique identification codes and restricting access to data files. Participants were informed of their right to withdraw from the study at any time without consequences to their healthcare services.

Results

The sample in this study consisted of 50 adult post-appendectomy patients, divided into two groups—25 patients in the intervention group and 25 patients in the control group. Respondent characteristics included gender, age, and educational level.

Table 1. Baseline Characteristics of Participants in the Intervention and Control Groups (n = 50)

Characteristic	Category	Intervention Group n (%)	Control Group n (%)
Gender	Male	25 (50.0)	25 (50.0)
Age	22-35 (early adulthood)	12 (48.0)	9 (36.0)
	36-45 (middle adulthood)	7 (28.0)	4 (16.0)
	46-58 (late adulthood)	6 (24.0)	12 (48.0)
Education	Elementary School	4 (16.0)	5 (20.0)
	Junor High School	7 (28.0)	10 (40.0)
	Senior High School	7 (28.0)	5 (20.0)
	College	7 (28.0)	5 (20.0)

Table 1 illustrates the distribution of participant characteristics indicating that the intervention and control groups had equal numbers. In accordance with the initial criteria, all respondents in this study were male, amounting to 50 people (100%). Most participants in the intervention group were in the early adulthood category (aged 22-35), while the majority in the control group were in the late adulthood category (aged 46-58). In the intervention group, participants had similar levels of junior high school, high school, and college education, followed by elementary school education. In the control group, the majority of participants had a junior high school education, followed by elementary school, high school, and college education in equal proportions.

Because this study employed a non-randomized allocation procedure, baseline characteristics were examined to assess the comparability of the intervention and control groups before the intervention. Descriptive analysis indicated some differences in age distribution between groups, with a greater proportion of older adults in the control group compared with the intervention group. Age has been identified as a factor that may influence pain perception, coping strategies, and recovery following surgery (Fillingim et al., 2009; Gagliese, 2009). Therefore, this difference should be considered when interpreting the observed intervention effects.

Although participants were recruited from the same clinical setting using identical inclusion and exclusion criteria, the possibility that baseline differences contributed to the study outcomes cannot be completely excluded. Consequently, the findings should be interpreted with appropriate caution, given the inherent limitations of a quasi-experimental design without random assignment.

Table 2. Normality Test (n=50)

Groups	Category	Statistic	df	Significance
Intervention	Pretest	0.196	25	0.015
Pretest	Posttest	0.278	25	<0.001
Posttest	Pretest	0.251	25	<0.001
Control	Posttest	0.300	25	<0.001

Table 2 illustrates the normality test results performed on the intervention and control groups. Based on the results of the normality test using the Kolmogorov-Smirnov test, a significance value ($p < 0.05$) was obtained, thus concluding that the data were not normally distributed. Therefore, data analysis was continued using the nonparametric Mann–Whitney statistical test.

Table 3. Comparison of Pain Scores Before and After Intervention Guided Imagery Therapy

Groups	Category	Mean	Median	Min-Max	SD	95% CI
Intervention	Pretest	4.88	5.00	3–6	0,971	4.48–5.28
	Posttest	1.68	2.00	1–3	0,690	1.40–1.96
Control	Pretest	4.84	5.00	3–6	0,898	4.47–5.21
	Posttest	4.44	5.00	2–6	0,870	4.08–4.80

Table 3 illustrates a comparison of mean pain intensity scores before and after the intervention in the intervention and control groups. This analysis aimed to

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examine changes in pain intensity from the first to the last day and to determine whether the guided imagery therapy intervention significantly reduced post-appendectomy pain in adult patients.

The results showed a significant reduction in pain intensity in the intervention group after the implementation of guided imagery therapy. The mean pain intensity decreased from 4.88 before the intervention to 1.68 after the intervention, representing an absolute reduction of 3.20 points. In contrast, the control group showed no significant difference in pain intensity between pre-test and posttest measurements. Pain intensity in the control group showed stable pain intensity, with minimal improvement from the first to the last day. These findings suggest that the observed pain reduction was related to the guided imagery therapy intervention and not simply routine care.

In addition to being statistically significant, the reduction in pain intensity observed in the intervention group appears to be clinically meaningful. The mean pain score decreased from 4.88 before the intervention to 1.68 after the intervention, representing an absolute reduction of 3.20 points. Overall, the results of the study showed that guided imagery therapy can reduce pain intensity better in the intervention group than in the control group in patients experiencing post-appendectomy pain.

Table 4. The Effects of Guided Imagery Therapy Using Mann–Whitney U Test

Groups	Mean (SD)	P Value
Intervention group	3.2 (0.76)	<0.001
Control group	0.4 (0.50)	<0.001

Table 4 illustrates that the results of the comparison test between the intervention group and the control group obtained a p value <0.05, which means there was a significant difference in pain intensity between the two groups after being given treatment. In the intervention group, patients were given iuided Imagery therapy as an additional non-pharmacological therapy, while the control group only received standard hospital care without guided imagery therapy. The results of the analysis showed that the reduction in pain scale in the intervention group was greater than in the control group. Thus, H0 was rejected and H1 was accepted. It can be concluded that guided imagery therapy can reduce pain intensity in adult patients after appendectomy in the Agate Bawah Ward, Dr. Slamet Garut Regional Hospital.

Throughout the intervention period, all participants were monitored to identify potential side effects related to Guided Imagery therapy. Monitoring results indicated no intervention-related side effects. No participants reported increased pain intensity, anxiety, or physical discomfort during therapy, and all participants completed the intervention sessions according to the established study protocol. Furthermore, no missing data were found during data collection or follow-up. All 50 participants completed the study and were included in the final analysis, thus eliminating the need for data imputation procedures or additional strategies for handling missing data.

Discussion

Postoperative conditions often cause pain as the body's response to tissue damage (Qian et al., 2022). Postoperative pain can reduce patient comfort, hinder the healing process, and even interfere with early mobilization, which is crucial in postoperative recovery. Pain experienced by patients after an appendectomy can stem from the incision, local inflammation, or postoperative tissue trauma (Bella et al., 2022).

The Gate Control Theory explains that pain is not solely determined by the presence of painful stimuli but is also influenced by regulatory processes in the spinal cord. This theory involves a "gate" that regulates whether pain signals can be transmitted to the brain. This gate can open or close depending on the activity of the nerves involved. Large-diameter nerve fibers that carry stimuli such as touch or pressure can help close the gate, thus blocking pain signals. Conversely, small nerve fibers that carry pain impulses open the gate, allowing pain signals to be transmitted more easily to the brain. Furthermore, psychological conditions such as attention, emotions, anxiety, and previous experiences can also influence this gate mechanism. The theory emphasizes that pain results from the interaction between physical stimuli and psychological factors, not simply the result of tissue damage (Moayedi & Davis, 2013).

In practice, guided imagery therapy encourages patients to imagine calm and pleasant scenes, such as a beach, a beautiful garden, or a happy experience they have experienced. This technique helps shift the patient's attention away from pain and toward a more relaxed and comfortable state of mind. According to the Gate Control Theory, attention and emotional state can influence the process of pain transmission to the brain. When patients feel calmer and focus on positive images, nerve activity that helps inhibit pain increases, while nerve activity that carries pain decreases. As a result, the pain "gate" in the spinal cord tends to close, reducing the patient's pain. Non-pharmacological therapy can help modulate pain perception by inhibiting the transmission of pain impulses at the thalamic level before they are transmitted to the cerebral cortex, so that the intensity of pain felt by the patient can be reduced (Sgourdou, 2022).

This study demonstrates that guided imagery therapy effectively reduced pain intensity in adult post-appendectomy patients. The results showed a significant reduction in pain intensity in the intervention group after three consecutive days of treatment. Additionally, guided imagery provides psychological benefits that can contribute to a morepositive postoperative mindset. This positive outlook could influence the patient’s perception of pain and their overall recovery experience, potentially leading to a reduction in complications and a shorter time to recovery (Anamagh et al., 2024). Guided imagery is a mind-body integrative practice that uses mental visualization to promote neurophysiological responses, with the aim of balancing and improving physical and mental symptoms (Santana et al., 2023).

The patient's age and education level influence the effectiveness of guided imagery therapy. According to (Mullins et al., 2022), age is a physiological factor that influences pain perception and intensity—older individuals tend to have higher pain perception due to decreased pain sensation, physiological changes, and increased inflammation. Furthermore, (Gagliese, 2009) explains that physiological and psychological changes that occur with aging can influence how individuals perceive, express, and cope with pain.

Nevertheless, all participants were recruited from the same clinical population, used uniform inclusion and exclusion criteria, and underwent the same measurement procedures throughout the study period. The results of this study still provide information regarding the potential benefits of guided imagery therapy in post-appendectomy patients. However, the causal relationship between the intervention and changes in pain intensity needs to be interpreted with caution, given the possible influence of underlying factors that are not entirely equivalent between groups.

Education is also a crucial factor in determining an individual's ability to receive and comprehend information, including understanding guided imagery therapy procedures and the pain scale used (Green, 2022; Singh et al., 2022). The higher a person's education level and younger age, the better their ability to interpret instructions, respond to visualizations, and perform relaxation techniques effectively (Liu et al., 2022). However, the present study did not specifically examine the association between educational level, age, and changes in pain intensity. Therefore, the potential influence of these characteristics on the effectiveness of guided imagery therapy in this study should be interpreted with caution and requires further investigation.

The results of this study are supported by (Aghakhani et al., 2022), who stated that guided imagery therapy is an effective non-pharmacological intervention for reducing pain perception by focusing the patient's mind on calming images. This therapy creates mental imagery and utilizes sensory features through the individual's imagination and memory, facilitating the achievement of desired therapeutic outcomes. stated that guided imagery therapy can be used as a non-pharmacological therapy to support postoperative pain management in patients in the intervention group. (Acar & Aygin, 2019) in their research, it was stated that guided imagery was effective in reducing pain in postoperative patients. In addition to pain relief, guided imagery has been shown to have a positive effect on pain and anxiety management (Aghakhani et al., 2022). The use of pharmacological methods for pain management can cause dangerous side effects and increase the costs of care and treatment. In contrast, the non-pharmacological treatment of guided imagery is free of complications—it can be easily taught to patients and can be used independently (Aghakhani et al., 2022).

Guided imagery has the potential to provide different outcomes in healthcare settings with limited resources, including limited nursing staff. This condition can affect the intensity of support and direct intervention provided to patients. However, guided imagery still has advantages because it can be performed with the aid of visual media, audio recordings, or simple guides, allowing patients to carry out the therapy independently or with minimal supervision from healthcare professionals. Previous studies have suggested that guided imagery is a practical and adaptable intervention in clinical settings.

Guided imagery has strong cultural and psychosocial relevance because the content of the imagery can be tailored to the patient's experiences, values, and comfort levels, such as imagining natural settings, the home environment, or emotionally meaningful positive experiences. This personalized approach can help increase calm, reduce anxiety, and strengthen the patient's relaxation response to pain. Therefore, this study not only contributes to strengthening evidence of the effectiveness of guided imagery in adult post-appendectomy patients but also offers an innovative nursing intervention that is adaptive, economical, and has the potential for widespread application in various healthcare settings with limited resources.

Overall, previous research studies have shown that guided imagery therapy is effective in helping reduce pain and anxiety levels in various patient conditions. However, research specifically examining the effectiveness of guided imagery in patients with acute pain after appendectomy surgery is still limited.

Furthermore, several previous studies used different populations, methods, and measurement instruments, so the results do not fully reflect the effectiveness of therapy in adult post-appendectomy patients. Therefore, this study was conducted to fill this gap by providing more specific evidence regarding the effect of guided imagery on pain reduction in adult post-appendectomy patients. This study also used consistent measurement instruments and was conducted in a clear clinical context, so it is hoped that it will provide more accurate and relevant data for nursing practice and health services.

Based on the results of the statistical analysis, supported by theory and respondent characteristics, it can be concluded that guided imagery therapy is an effective, safe, and feasible non-pharmacological method to help reduce pain in adult post-appendectomy patients. Not only from a physiological perspective, this therapy also provides emotional comfort, fosters a sense of control over the body, and increases patient active participation in the healing process.

Implications and limitations

The findings of this study indicate that guided imagery therapy has the potential to be an effective complementary intervention in adult post-appendectomy pain management. This calming, comfort-focused approach may also help improve quality of care and support psychological recovery. However, several limitations should be considered when interpreting the findings. First, the study was conducted in a single healthcare center and included only male participants, which may limit the generalizability of the results to other healthcare settings and female populations. Second, the non-randomized allocation procedure may have introduced selection bias and resulted in baseline differences between groups, particularly in age distribution, which could have influenced pain perception and response to the intervention. Third, although all participants received standard postoperative care, variations in analgesic administration and timing could not be completely controlled and may have affected pain outcomes. Fourth, participants in the intervention group received additional therapeutic attention and interaction, which may have contributed to expectancy effects that influenced reported pain intensity. Furthermore, pain outcomes were assessed by personnel involved in delivering the intervention. Therefore, observer expectancy bias may have occurred because outcome assessors were aware of participants' group assignments and the nature of the intervention. In addition, pain intensity was measured using a subjective self-report scale, which may have introduced response bias. Finally, the relatively short follow-up period limited the ability to evaluate the long-term effectiveness of guided imagery therapy. Future studies should employ randomized controlled designs, include more diverse populations, standardize analgesic management, utilize independent blinded outcome assessors whenever feasible, incorporate blinding where possible, and assess long-term outcomes to strengthen the evidence base for guided imagery therapy.

Relevance to Practice

The results of this study have significant relevance for nursing practice, particularly in the application of non-pharmacological pain management in adult post-appendectomy patients. Nurses, as providers of nursing care, play a key role in integrating guided imagery therapy into the postoperative care pathway, for example, through relaxation sessions before and after nursing procedures, when patients report pain, or as part of patient recovery education. This therapy can be supported by the use of verbal guidance, visual media, or audio recordings, making it easier to consistently apply in daily care. To support optimal implementation, training is needed for nursing staff in guided imagery techniques, therapeutic communication, and evaluating patient responses to therapy. Furthermore, developing SOPs related to the implementation of guided imagery therapy is crucial to ensure that interventions are delivered in a structured, safe, and evidence-based manner. Nursing education programs can also incorporate guided imagery as part of complementary therapy learning in pain management. Hospital administrators and policymakers are expected to support the integration of non-pharmacological therapy by providing supporting facilities, developing holistic service policies, and encouraging the implementation of effective, economical, and quality-oriented nursing interventions for patient care.

Conclusion

The results of this study provide preliminary evidence that guided imagery therapy has the potential to be a beneficial non-pharmacological intervention in helping reduce pain intensity in adult patients after appendectomy. This therapy has the potential to improve patient comfort, support the recovery process, and complement pharmacological pain management in clinical practice. Further research is recommended to use a randomized controlled trial design and involve multiple healthcare centers (multicenter studies) to increase internal and external validity and ensure the generalizability of the results to a broader population. Future research could also explore the long-term effectiveness of guided imagery therapy through longer follow-up periods, control for potentially confounding factors that could influence the results, and involve participants with a wider range of characteristics, including women. Thus, the findings of this study support preliminary evidence regarding the potential benefits of guided imagery therapy as a complementary intervention in postoperative pain management. However, its effectiveness requires further confirmation through studies with more robust methodology and a broader population.

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CrediT Authorship Contributions Statement

Dya Sustrami and A.V Sri Suhardiningsih: Conceptualization, Methodology, Supervision

Ardin Putra Widianto: Investigation, Resources, Data Curation, Project Administration, Writing - Original Draft

Sri Anik Rustini: Writing - Original Draft, Review & Editing, Visualization

Conflicts of Interest

There is no conflict of interest.

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