Jurnal
Berita Ilmu Keperawatan

Jurnal Berita Ilmu Keperawatan
Vol. 19 (2), 2026
p-ISSN: 1979-2697
e-ISSN: 2721-1797
https://doi.org/10.23917/bik.v19i2.16508

Effect of Guided Imagery Therapy on Arteriovenous Fistula Cannulation Pain during Hemodialysis: A Quasi-Experimental Study

Imelda Rahmayunia Kartika[1*], Fitrianola Rezkiki[2], Dini Safitri[3]
[1,2]*Department of Fundamental Nursing and Nursing Management, Universitas Fort De Kock, Bukitinggi, 37492, West Sumatera, Indonesia*
[3]*Nurse on Hemodialysis Unit at Government Hospital, 37492, West Sumatera, Indonesia*
*Correspondence: imelda.rahmayunia@fdk.ac.id

Abstract:
*Arteriovenous fistula (AVF) cannulation is a routine but painful procedure for patients during hemodialysis, which can lead to pain, anxiety, discomfort, and reduced treatment adherence. Repeated painful cannulation may increase anxiety, reduce comfort, and negatively affect the overall treatment experience. Although guided imagery has shown potential for relieving pain in various clinical settings, its effectiveness during AVF cannulation has received limited attention, particularly among patients undergoing hemodialysis. Therefore, further research is necessary to establish its effectiveness in this context. **T**he objective of this study was to evaluate the effect of guided imagery therapy on pain intensity during AVF cannulation among patients undergoing hemodialysis. A quasi-experimental study with intervention and control groups was conducted among 30 patients undergoing hemodialysis who were recruited using consecutive sampling from a hemodialysis unit. Participants in the intervention group received guided imagery therapy immediately before AVF cannulation, whereas those in the control group received routine nursing care. Pain intensity was assessed using the Numeric Rating Scale (0–10). Group differences were analyzed using an independent t-test, and the magnitude of the intervention effect was evaluated using Cohen's d. The results of this study, pain intensity before cannulation was similar between the two groups. After the intervention, patients who received guided imagery reported significantly lower pain scores (Mean = 1.27, SD = 1.03) than those receiving routine care (Mean = 4.27, SD = 0.88), with a mean difference of 3.00 (95% CI: 2.28–3.72; $p < .001$). The intervention produced a very large effect (Cohen's d = 3.12), indicating a substantial reduction in procedural pain. Guided imagery therapy may offer a simple and feasible non-pharmacological approach to reducing pain during AVF cannulation in patients undergoing hemodialysis. However, because this study involved a small sample and used a quasi-experimental design, the findings should be interpreted with caution. Further randomized controlled trials with larger samples are needed to confirm these results.*

Keywords: *Guided imagery, pain management, arteriovenous fistula, hemodialysis, nursing intervention*

Submitted: 1 March 2026 Revision: 20 July 2026 Accepted: 21 July 2026

INTRODUCTION

Chronic kidney disease (CKD) is a progressive condition that frequently leads to the patient having "end-stage renal disease" (ESRD), requiring them to undergo long-term hemodialysis for long-term survival (Kassim et al., 2023). CKD is such a catastrophic health condition whose prevalence continues to increase worldwide over the years (Juwita & Kartika, 2019). In Indonesia, data from the Indonesian Renal Registry (IRR) as of 2024 reported that a substantial proportion of patients with CKD had progressed into the advanced stage, such as end-stage renal disease (ESRD), requiring and receiving renal replacement therapy. Hemodialysis becomes one of the most commonly used renal replacement therapies for 98% of patients with ESRD, while 2% use CAPD (Continuous Ambulatory

Peritoneal Dialysis). Globally, the World Health Organization reported that in 2016 approximately 2.62 million individuals were undergoing hemodialysis, with projections indicating a continued to be increase by 2030. In 2021, an estimated 674 million people worldwide were living with chronic kidney disease (CKD). In high-income North America, the prevalence remained relatively stable, but mortality and disability continued to be high, with a mortality rate of 20.6 per 100,000 population and 508.8 disability-adjusted life years per 100,000 population. In contrast, East Asia experienced an 11.7% reduction in CKD prevalence, accompanied by lower mortality (11.1 per 100,000 population) and disability-adjusted life years (322.4 per 100,000 population). The greatest burden was observed in regions with low socio-demographic development, particularly sub-Saharan Africa and South Asia, where CKD prevalence exceeded 9,000 cases per 100,000 population, and the associated disability burden continued to increase (Li et al., 2025). In Indonesia, the number of patients undergoing hemodialysis has also increased in line with the expansion of hemodialysis units worldwide (Iryawati et al., 2025). According to the 17th Annual Report of the Indonesian Renal Registry (2024), the number of patients receiving maintenance hemodialysis in Indonesia has increased substantially over the past decade. The annual incidence of patients initiating chronic hemodialysis rose from 4,977 cases in 2007 to 60,034 cases in 2024, while the prevalence increased from 1,885 to 136,793 patients during the same period. Although both indicators have shown some fluctuations in recent years, these figures reflect the growing burden of end-stage kidney disease (ESKD) and the increasing demand for long-term hemodialysis services in Indonesia, Hence, in West Sumatera, there are 857 new cases in 2024 contribute as around 1,3% of all patients in Indonesia (Indonesian Renal Registry, 2024).

Hemodialysis as a most common therapeutic intervention for patients with ESRD requires reliable vascular access to facilitate blood circulation between the body and the dialyzer

(Bode & Tordoir, 2013). Despite its life-sustaining benefits, hemodialysis requires repeated vascular access procedures, particularly arteriovenous fistula (AVF) cannulation, during every treatment session. Because AVF cannulation is performed several times each week, patients are repeatedly exposed to procedural pain and discomfort that may negatively affect their treatment experience and overall well-being (Peralta et al., 2023). The common vascular access types that used were arterio-venous fistula (AVF) while 77% patients undergoing Hemodialysis regularly used this procedure, arterio-venous graft (AVG), and central venous catheters, such as double-lumen catheters or tunneled cuffed catheters (IRR, 2024). Among these options, AVF—also known as an arteriovenous shunt or Cimino fistula. It becomes considered the preferred access because its superior patency rate, lower risk of infection, and fewer complications compared to other vascular access methods. AVF is surgically created by connecting an artery and a vein in a line, typically taken into the non-dominant arm (Lawson et al., 2020). The procedure should make the pain during the hemodialysis process. Therefore, identifying safe, practical, and effective non-pharmacological interventions to reduce cannulation-related pain remains an important priority in nursing care.

Pain experienced during AVF cannulation procedures is classified as an acute pain. According to the IASP (International Association for the Study of Pain), the pain itself is defined as an unpleasant sensory and emotional experience due to actual or potential tissue damage. AVF cannulation is perceived as particularly painful process because the needles used are large (16-gauge), larger than those used for usual peripheral intravenous cannulation (Desnita, 2018). It feel like a severe and anxiety-provoking stimulus due to the large-gauge needles required for adequate blood flow as well (Fareed et al., 2025). Recurrent AVF cannulation during hemodialysis induces pain and also considered one of the most common complications associated with the procedures taken (Mutiara Dewi & Masfuri, 2021). Previous studies have reported that 63.1% of hemodialysis patients experience pain related to the AVF cannulation. Routine hemodialysis performed two to three times per week may experience needle-related pain approximately 300 times per year (Sadigova et al., 2020). Another study reported that among patients who had been undergoing hemodialysis for one year or more, 32.5% experienced moderate pain, 30.8% tend to be experienced mild pain, and 27.4% experienced the severe pain during AVF cannulation (Ibrahim et al., 2022). Several studies have documented varying levels of pain intensity associated with AVF cannulation. On another study also found that before the application of

a cold compress at the LI-4 acupoint, two-thirds of patients reported moderate pain intensity (score 4–6), with a mean pain score of 5.36 (SD = 1.47) (Saputra & Nasution, 2021). Moreover, patients have to undergo two needle insertions during each hemodialysis session: one for the blood flow from the body to the dialyzer and another for returning blood from the dialyzer to the body. Pain is among the most common and distressing complications reported, negatively affecting patient comfort, treatment adherence, and overall quality of life (Sharifnia et al., 2025).

Effective pain management has become an important role in nursing intervention. It is not only to improve patient experience but also to enhance adherence to lifesaving measures for prolonged hemodialysis therapy in chronic kidney disease patients. Although some of the pharmacological options such as local anesthetics are widely used in managing pain, non-pharmacological strategies have gained attention due to their feasibility in clinical settings and minimal risk for adverse effects (Kassim et al., 2023; Sharifnia et al., 2025). These interventions may include physical methods (e.g., cryotherapy, distraction techniques, massages), psychological approaches (e.g., relaxation, deep breathing, cognitive distraction), and complementary therapies, which have shown a statistical effect on reducing procedural pain among hemodialysis patients in the hemodialysis room (Fareed et al., 2025; Kassim et al., 2023; Sharifnia et al., 2025). A recent systematic analysis of pain management interventions in hemodialysis also identified commonly such a several non-pharmacological interventions that are capable of reducing cannulation-related pain; however, there is a gap in high-quality evidence regarding the specific procedure of imagery-based techniques for the AVF cannulation process (Sharifnia et al., 2025). Moreover, while guided imagery therapy is recommended in broader pain management literature due to its low cost, easy on implementation, and the most common positive effects on psychological outcomes (Salimi Akinabadi et al., 2024), its application in routine dialysis care warrants further empirical investigation to establish its effectiveness and practical integration among clinical protocols, especially in hemodialysis conditions.

Nurses play a central role in pain management and are expected to possess the knowledge and skills needed to minimize pain and discomfort during invasive procedures. Effective pain management not only alleviates pain but also improves patient comfort and the overall treatment experience (Utami & Kartika, 2018b). Interventions that can be used to reduce pain from repeated AVF cannulation are important for patients on hemodialysis to improve treatment adherence and maintain quality of life. (Rahman et al., 2020). Guided imagery, one of the cost-effective complementary therapies, has been recommended as an alternative approach for pain management (Parizad et al., 2021). Guided imagery is a cognitive-behavioral technique that uses in focusing mental visualization to evoke sensory experiences and promote relaxation. It is hypothesized to act as a form of cognitive distraction, shifting attention away from painful stimuli and continuing to reduce the perception of pain (Parizad et al., 2021). Previous studies have demonstrated its effectiveness in reducing procedural pain and improving patient comfort across various clinical settings. (Acar & Aygin, 2019; Salimi Akinabadi et al., 2024). Although many of these studies have focused on surgical or acute procedural contexts, evidence supporting the efficacy of guided imagery specifically for hemodialysis-related pain tends to be limited, particularly in the context of AVF cannulation. Guided imagery activates the mind–body connection, promoting well-being, reducing stress and anxiety, and enhancing immune function (Krau, 2020). Guided imagery may also serve as a distraction from painful stimuli, thereby reducing their pain perception (Utami & Kartika, 2018). However, evidence regarding its effectiveness during AVF cannulation among patients undergoing hemodialysis remains limited. Guided imagery is typically delivered through structured verbal instructions, with or without background music, to facilitate mental visualization and relaxation (Cole, 2021).

Although guided imagery has been reported to reduce pain during a range of medical procedures, its use during arteriovenous fistula (AVF) cannulation has received relatively little attention. Most previous studies have involved patients undergoing surgery, labor, or other acute procedures, while evidence among patients receiving maintenance hemodialysis is still limited. In Indonesia, studies on guided imagery for AVF cannulation are also scarce, even though many patients undergo repeated cannulation several times each week. More evidence is therefore needed to determine

whether guided imagery can help reduce pain in this setting and support its use as part of routine nursing care. Based on this gap, the present study aimed to evaluate the effectiveness of guided imagery therapy in reducing pain intensity during AVF cannulation among patients undergoing hemodialysis.

METHODS

Study Design

This quasi-experimental study employed a non-randomized control group design to evaluate the effectiveness of guided imagery therapy in reducing pain during arteriovenous fistula (AVF) cannulation among patients undergoing maintenance hemodialysis. Participants were assigned to either the intervention or control group using a non-random allocation method based on their scheduled hemodialysis sessions. To minimize selection bias, eligible patients were recruited consecutively according to the predefined inclusion and exclusion criteria until the required sample size was achieved. Each group consisted of 15 participants.

Trial Registration

This study was prospectively registered in the Indonesian Clinical Research Registry (INA-CRR) under the registry number of INA-EC0BA9D on January, 09, 2026. The registered protocol included detailed information regarding the study objectives, some of the eligibility criteria, the intervention procedures, expected outcome measures, and statistical analysis plans to ensure transparency and adherence to international reporting standards.

Reporting Guideline

This manuscript was prepared in accordance with the Consolidated Standards of Reporting Trials (CONSORT) extension for non-pharmacological interventions. Statement to improve the completeness and transparency of reporting for non-randomized intervention studies.

Participants and Setting

The study was conducted in the Hemodialysis Unit of Prof. Dr. M. A. Hanafiah Government Hospital, Batusangkar, West Sumatra, Indonesia. Participants were recruited consecutively between October to December, 2022. A total of 36 patients were assessed for eligibility. Of these, 30 patients met the eligibility criteria, provided written informed consent, and were enrolled in the study. Participants were assigned to either the intervention group (n = 15) or the control group (n = 15) according to the predetermined non-random allocation schedule. Eligible participants were adults (≥18 years) diagnosed with end-stage kidney disease, undergoing maintenance hemodialysis using an arteriovenous fistula as vascular access, able to communicate verbally, and willing to participate in the study. Patients were excluded if they had received analgesic or sedative medication before cannulation, had cognitive impairment, psychiatric disorders, or severe visual or hearing impairment, patients with severe hearing loss, peripheral neuropathy, or had an unstable hemodynamic condition. Baseline demographic and clinical characteristics were compared between the two groups before the intervention to assess group comparability.

The sample size was determined based on the number of eligible patients available during the study period. A total of 30 participants who met the eligibility criteria were recruited consecutively and allocated to the intervention (n = 15) and control (n = 15) groups. Although a formal a priori sample size calculation was not performed, all eligible patients during the recruitment period were enrolled to maximize the available sample for analysis (Figure 1).

Intervention

Participants in the intervention group received guided imagery therapy immediately before arteriovenous fistula (AVF) cannulation during a routine hemodialysis session. In the study setting, patients routinely underwent maintenance hemodialysis twice weekly, with fixed treatment schedules on Monday and Thursday, Tuesday and Friday, or Wednesday and Saturday. The guided imagery

intervention was administered once during one of the participants' scheduled dialysis sessions before AVF cannulation. The intervention was a 15-minute pre-recorded audio session, played through earphones in a quiet part of the hemodialysis unit. The recording, created and delivered by the research team, led participants through a series of deep breathing exercises, progressive relaxation, calming mental imagery, and positive affirmations. During the session, participants were encouraged to sit or lie comfortably, close their eyes, breathe slowly and visualize peaceful natural scenes such as a beach, garden or mountain landscape, while focusing on narrated instructions. The guided imagery session was completed once before AVF cannulation. Pain intensity was assessed using the Numeric Rating Scale (NRS) immediately after AVF needle insertion to ensure a consistent assessment point for all participants.

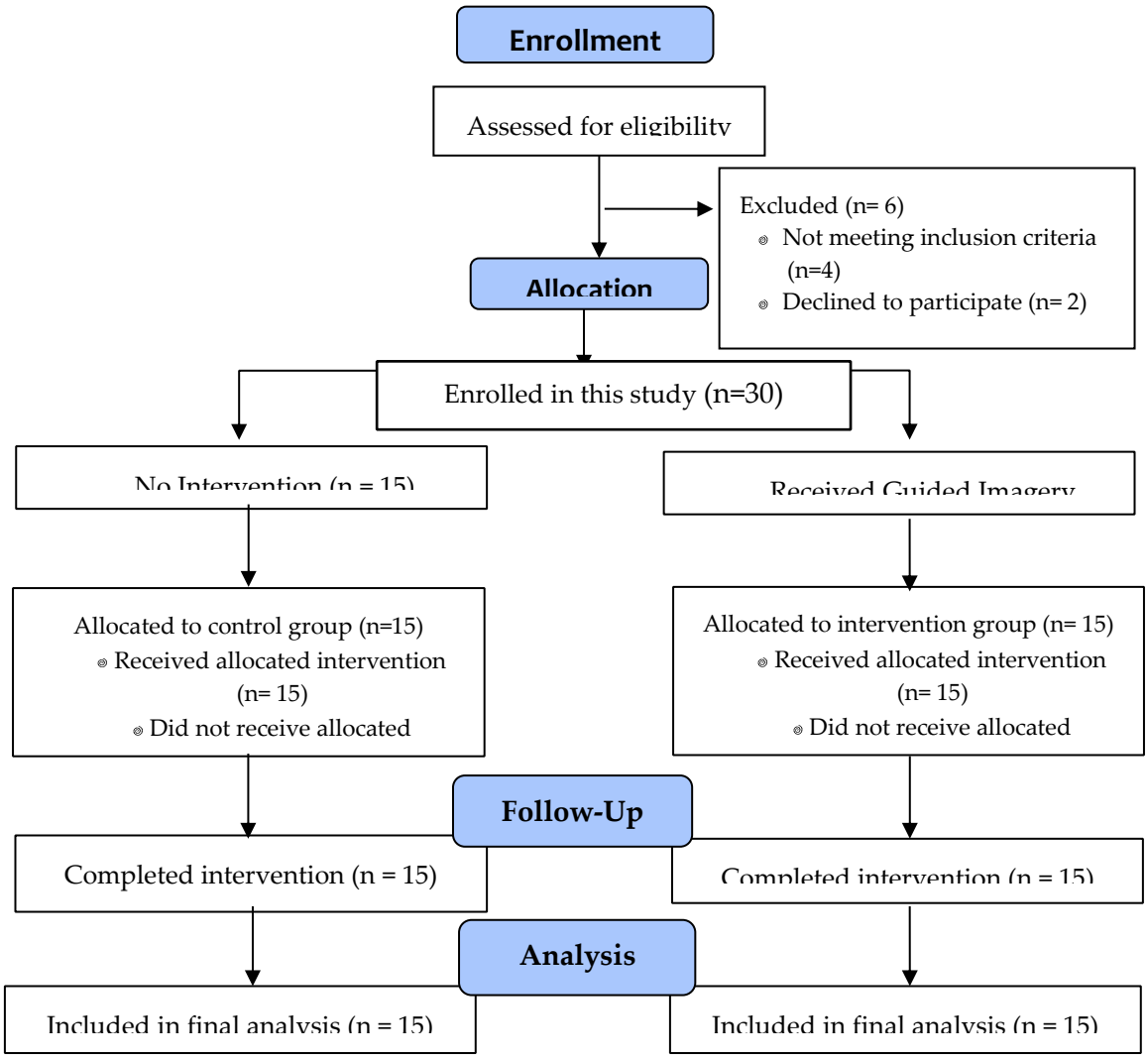

Figure 1. Flow Diagram of Participant Recruitment, Group Assignment, Follow-up, and Analysis

Participants in the control group received routine nursing care without guided imagery or any additional structured non-pharmacological pain management intervention. To minimize potential confounding, patients who had received analgesics or sedative medications before cannulation were excluded from the study. In addition, topical lidocaine spray was not used in the intervention group during the study period. No adverse events related to the intervention were observed.

Measurement

Pain intensity during AVF cannulation served as the primary outcome. Pain was assessed immediately after cannulation using a validated pain scale (e.g., Numeric Rating Scale (NRS) with the Scale of (0–10), where 0 indicates no pain and 10 indicates worst possible pain (Hansen et al., 2020). Pain assessment was conducted by trained nurses who were not involved in administering the intervention.

Data Analysis

Data were analyzed using SPSS statistical software. Descriptive statistics were used to describe the participant characteristics and baseline data. Normality of data distribution was tested using the Shapiro–Wilk test and supported with histogram visualization. Data were normally distributed, independent t-test was used to compare pain scores between groups. The significance level was set at $p < 0.05$. Effect size was calculated (Cohen's d for parametric data or r for non-parametric analysis) to determine the magnitude of the intervention effect.

Ethical Considerations

Ethical approval was obtained from the Ethical Committee of Fort De Kock (Approval Number: 495/KEPK/X/2022). The study followed the ethical principles of the Declaration of Helsinki. Participation was voluntary, confidentiality and anonymity were maintained, and patients were free to withdraw at any time without affecting their treatment.

RESULTS

Participant Characteristics

A total of 30 patients undergoing maintenance hemodialysis participated in the study (Table 1), with 15 participants assigned to each group. Overall, the largest proportion of participants was aged 56–65 years (40.0%). The distribution of male and female participants was equal (50.0% each). Most participants had been receiving hemodialysis for 1–2 years (36.7%), while half had used an arteriovenous fistula for less than one year (50.0%).

Table 1. Participant Demographics (n = 30)

Variable	Control n (%)	Intervention n (%)	Total n (%)
Age category			
26–35 years	3 (20.0)	1 (6.7)	4 (13.3)
36–45 years	2 (13.3)	2 (13.3)	4 (13.3)
46–55 years	5 (33.3)	2 (13.3)	7 (23.3)
56–65 years	3 (20.0)	9 (60.0)	12 (40.0)
> 65 years	2 (13.3)	1 (6.7)	3 (10.0)
Gender			
Male	8 (53.3)	7 (46.7)	15 (50.0)
Female	7 (46.7)	8 (53.3)	15 (50.0)
Duration of haemodialysis			
< 1 year	4 (26.7)	5 (33.3)	9 (30.0)
1–2 years	6 (40.0)	5 (33.3)	11 (36.7)
> 2 years	5 (33.3)	5 (33.3)	10 (33.3)
Duration of AVF use			
< 1 year	8 (53.3)	7 (46.7)	15 (50.0)
1–2 years	3 (20.0)	3 (20.0)	6 (20.0)
> 2 years	4 (26.7)	5 (33.3)	9 (30.0)

Pain Intensity among Hemodialysis Patients during AVF

Table 2 represents the comparison of mean pain intensity scores before and after cannulation in both the control and the intervention groups. Pain was assessed by using the Numeric Rating Scale (NRS) ranging from 0 to 10, where higher scores indicate more severe pain. This table shows the change in

pain intensity following arteriovenous fistula cannulation and illustrates the effect of guided imagery therapy on pain reduction among hemodialysis patients.

Table 2. Pain Intensity Before and After AVF Cannulation According to Study Group (N = 30)

Variable	Control (n=15)	Intervention (n=15)
Pain score before cannulation		
Mean ± SD	4.80 ± 0.86	4.33 ± 0.90
Range	3–6	3–6
Pain score after cannulation		
Mean ± SD	4.27 ± 0.88	1.27 ± 1.03
Range	3–6	0–3
Pain category after cannulation, n (%)		
No pain (0)	0 (0.0)	4 (26.7)
Mild pain (1–3)	3 (20.0)	11 (73.3)
Moderate pain (4–6)	12 (80.0)	0 (0.0)
Severe pain (7–10)	0 (0.0)	0 (0.0)

*Pain measured using Numeric Rating Scale (0–10)

Before the intervention, both groups demonstrated comparable levels of pain intensity scores. The control group reported a mean pre-cannulation pain score of 4.80 (SD = 0.86), while the intervention group showed a mean score of 4.33 (SD = 0.90). It was indicated that patients in both groups experienced moderate pain prior to the procedure. However, a distinct change was observed following cannulation. In the control group, pain intensity showed a slight decrease to 4.27 (SD = 0.88), suggesting that routine care alone resulted in minimal pain reduction and patients continued to experience moderate discomfort. In another hand, as a contradictory statement, this study showed a substantial decline in pain intensity that occurred in the intervention group following guided imagery therapy, with the mean score decreasing to 1.27 (SD = 1.03).

This result indicated a shift from moderate pain levels to very mild or no pain perceived, as reflected in the minimum–maximum range of 0–3. As a result, Table 2 demonstrates the overall results that stated the guided imagery therapy produced a clinically meaningful reduction in pain compared with routine care for patients during the hemodialysis procedure, especially during the AVF cannulation process. While the control group showed such a small decline, patients receiving guided imagery will also experience a marked improvement, supporting the effectiveness of this non-pharmacological intervention in reducing cannulation pain among hemodialysis patients. Before the independent t-test, the normality of the pain intensity scores was assessed using the Shapiro–Wilk test, which is recommended for small sample sizes. The data were considered to be normally distributed; an independent t-test was performed to compare post-cannulation pain intensity between the intervention and control groups. The results are presented in Table 3.

Table 3. The Difference in Post-Cannulation Pain Intensity Scores Between Intervention and Control Groups

Variable	**Control (n=15)**	**Intervention (n=15)**	**Mean Difference (95% CI)**	**t (df)**	**p**
Post-cannulation pain score	4.27 ± 0.88	1.27 ± 1.03	3.00 (2.28 to 3.72)*	8.58 (28)	< .001

*95% confidence interval calculated from summary statistics

An independent-samples t-test demonstrated that post-cannulation pain intensity was significantly lower in the intervention group than in the control group ($t(28) = 8.58$, $p < .001$). The mean difference between groups was 3.00 points (95% CI: 2.28–3.72). The corresponding effect size was very large

(Cohen's d = 3.13), indicating a substantial difference in pain intensity between the two groups (Table 3).

Table 4. Effect Size of Guided Imagery on Pain Reduction

Effect Size Indicator	Value	Interpretation
Cohen's d	**3.12**	Very large effect
Effect size r	***0.77**	Very large effect

* Indicates strong clinical and statistical impact of guided imagery therapy

The comparison of post-cannulation pain intensity scores between the intervention and control groups demonstrated a statistically and significantly meaningful difference. As shown in Table 3, patients in the control group reported a higher mean pain intensity score (M = 4.27, SD = 0.88) compared with those who received the guided imagery therapy (M = 1.27, SD = 1.03). The mean difference of 3.00 (95% CI: 2.28–3.72; p < .001) was statistically significant (p < .001), indicating that guided imagery substantially reduced pain intensity following arteriovenous fistula cannulation among hemodialysis patients. This finding suggests that guided imagery provides immediate pain relief during a painful invasive procedure. Effect size analysis further strengthens the magnitude of this impact. As presented in Table 4, the Cohen's d value of 3.12 indicates a very large effect, far exceeding the conventional threshold of 0.80 for a large effect. Similarly, the effect size r value of 0.77 reflects a very strong association between guided imagery therapy and pain reduction outcomes. These results also confirm that guided imagery is not only statistically significant but also highly effective in a practical and clinical context. This study showed that guided imagery therapy is a powerful non-pharmacological intervention capable of significantly reducing cannulation pain among hemodialysis patients. The strength of the effect suggests that guided imagery can be considered a feasible, low-cost, safe, and highly beneficial complementary pain management strategy in hemodialysis settings.

The observed effect size (Cohen's d = 3.12) suggests a very large difference in pain intensity between the intervention and control groups. Although this finding indicates a potentially meaningful clinical benefit, it should be interpreted with caution. The present study was conducted using a quasi-experimental design with a relatively small sample and did not include blinding of participants or outcome assessors. These methodological characteristics may have influenced participants' self-reported pain ratings and contributed to an overestimation of the intervention effect. In addition, effect size estimates from small studies tend to be less stable than those obtained from larger trials. Further randomized controlled studies involving larger and more diverse patient populations are needed to confirm the magnitude of the effect observed in this study.

DISCUSSIONS

This study demonstrated that guided imagery significantly reduced the pain intensity during arteriovenous fistula (AVF) cannulation in Chronic Kidney Disease (CKD) patients who were undergoing hemodialysis. The intervention group exhibited substantially the results that showed a lower post-cannulation pain intensity scores compared to the control group, with a mean difference of 3.00 (p < .001), indicating a statistically significant effect. Guided imagery tends to offer a valuable non-pharmacological intervention to become routine care in managing procedural pain associated with hemodialysis. Guided imagery, as one of the cognitive-behavioral techniques, can involve the deliberate generation of sensory experiences, particularly imagery, to gain relaxation and positive emotional states (Kartika et al., 2023; Perry & Potter, 2016). The method engages multiple sensory modalities—especially visual and auditory channels—to direct the individual's focus toward pleasant and calming imaginary scenes. This method is about delivering focused attention, which reduces mental capacity available for processing the painful stimuli on the nervous system, aligning with the basic premise of distraction-based interventions. The cognitive engagement required during guided imagery promotes a state of deep concentration, facilitating relaxation and diminishing the subjective experience of pain (Zemla et al., 2023).

There are theoretical bases for the effectiveness of guided imagery that can be partially explained by the gate control theory of pain, which posits that pain perception is modulated by neural gating mechanisms at the level of the dorsal horn in the spinal cord. According to this model, only one type of neural impulse can be transmitted through the gate to the brain at a time; thus, non-painful inputs—such as those generated through guided imagery—can inhibit the transmission of nociceptive signals and effectively "close the gate" to pain (Aghakhani et al., 2022). Guided imagery may activate the descending inhibitory pathways and interneurons in the substantia gelatinosa, then reducing the salience of pain signals and resulting in decreased pain perception. Additionally, guided imagery has been associated with the stimulation of the endogenous opioid system in the body. Endorphins, which are naturally occurring neuropeptides produced by the pituitary gland, are believed that have the contribution to analgesia through their interaction with opioid receptors in the central nervous system. Relaxation using deep breathing and positive imagery may enhance endorphin release, further attenuating pain perception (Krau, 2020). This mechanism supports the notion that interventions promoting relaxation and positive affect can exert measurable effects on pain outcomes.

The evidence from several studies about chronic illness populations further strengthens the rationale for implementing this guided imagery in routine and daily care. Several studies have shown the positive effects in cancer-related pain using this relaxation-based guided (Bozkurt-Duman et al., 2025; Hartshorn et al., 2022), also commonly used in musculoskeletal pain (Jochimsen et al., 2024), and can be taken on adults patients in ICU settings with chronic illness experiencing post-event pain and anxiety (Hadjibalassi et al., 2018). All of these results show that guided imagery works not only for short-term procedural pain but also for long-term and repeated pain. This is especially important for hemodialysis patients who have to have vascular access procedures for the rest of their lives. Recent research in neuroscience also backs up these clinical findings by showing that they are biologically possible. Guided imagery has been shown to affect brain areas that help control pain, such as the anterior cingulate cortex and the prefrontal cortex, by increasing top-down inhibitory control (Kong, 2024; Zeidan et al., 2012). Furthermore, this kind of relaxation-based cognitive intervention has been associated with increasing parasympathetic activation and endorphin release in the human nervous system (Krau, 2020), reinforcing the theoretical mechanisms previously discussed about the sensory aspects of pain.

There are the baseline findings from this study related to previous research, even in different clinical and sample settings. For example, there was a randomized-controlled trial from a previous study that used guided imagery showed the significantly reducing menstrual pain among adolescent girls, with $p < .001$ indicating a strong effect of the intervention (Kartika et al., 2022). Another study stated that guided imagery therapy has been shown to decrease pain among patients recovering from myocardial infarction ($p = .002$) (Febtrina & Febriana, 2019). Additional evidence and studies also support the use of guided imagery in a range of painful conditions, including gastritis and gastrointestinal conditions (Utami & Kartika, 2018a), headache disorders (Abdoli et al., 2012), and pain associated with cancer case (Kasi, 2025). These studies collectively underscore the direct applicability and potential utility of guided imagery in reducing acute and chronic pain across patient populations worldwide. Despite the continuing results, the underlying mechanisms by which guided imagery exerts its analgesic effects warrant further exploration through neurophysiological studies. Future research should also be conducted to examine the long-term effects of using guided imagery and its potential synergistic impact when combined with other psychological or physical pain management strategies.

The findings of this study also align with a some of international literature which explained the demonstrating of effectiveness of guided imagery in reducing procedural and chronic pain across diverse settings and patient groups. Recent studies were conducted in hemodialysis settings, which have similarly reported that mind–body interventions and manipulation as complementary methods can effectively control pain and anxiety during vascular access procedures and dialysis sessions. Other studies also conclude that listening to music therapy in hemodialysis patients can reduce anxiety (Kamila et al., 2023) while the Benson therapy has the same effect to be considered (Anisah & Maliya, 2021). For instance, another study found that guided imagery significantly reduced pain and stress itself among hemodialysis patients undergoing repeated needle insertions and during VF procedures (Afshar et al.,

2018). Additionally, a previous study demonstrated that guided imagery improved patient comfort and reduced physiological stress responses during hemodialysis treatment (Beizaee et al., 2018). Not only in hemodialysis settings, but several randomized controlled trials provide strong support for the analgesic effects of guided imagery in various clinical contexts. Another study reported significant reductions in procedural pain and anxiety among surgical and hospitalized patients receiving guided imagery therapy (Kartika et al., 2023). Similarly, one systematic review concluded that guided imagery is consistently associated with reductions in pain intensity and psychological distress across settings, highlighting its significant effects as a non-pharmacological pain management strategy (Sulistiyawati et al., 2024).

The findings of this study add to the growing body of evidence supporting guided imagery as a simple and low-cost non-pharmacological approach for managing procedural pain. Participants who received guided imagery reported lower pain intensity during AVF cannulation, which is consistent with previous studies demonstrating its effectiveness in reducing pain during medical procedures (Acar & Aygin, 2019; Parizad et al., 2021). One possible explanation is that guided imagery redirects attention away from painful stimuli through focused mental visualization while promoting relaxation and controlled breathing. These processes may reduce the emotional and cognitive response to pain, resulting in a lower perceived pain intensity during needle insertion. Although the findings are encouraging, they should be interpreted with caution because this study was conducted in a single hemodialysis center using a quasi-experimental design and a relatively small sample. Therefore, the results may not be generalizable to all hemodialysis populations. Larger randomized controlled trials involving diverse clinical settings are needed to confirm the effectiveness of guided imagery and to determine its role as part of routine pain management during AVF cannulation.

In addition, several potentially important clinical variables, including the underlying cause of end-stage kidney disease, comorbidities, frequency of hemodialysis, and previous AVF cannulation experience, were not collected. These factors may influence pain perception and should be considered in future studies. This study considers the important role of nurses in implementing non-pharmacological pain management strategies in hemodialysis care. Guided imagery can be incorporated as a standardized nursing intervention before AVF cannulation to promote relaxation, enhance coping, and reduce pain perception. Nurses should receive structured training to ensure effective delivery and patient engagement. Integration of guided imagery into routine clinical protocols contributes to holistic, patient-centered care, strengthens therapeutic relationships, and supports nursing efforts to improve quality of care and patient well-being in hemodialysis settings.

CONCLUSION

This study found that guided imagery therapy was associated with lower pain intensity during arteriovenous fistula (AVF) cannulation among hemodialysis patients. Participants who received guided imagery reported significantly lower post-cannulation pain scores than those who received routine care, suggesting that guided imagery may be a useful complementary approach for managing procedural pain. Although these findings are encouraging, they should be interpreted with caution because the study was conducted in a single center using a quasi-experimental design with a relatively small sample. Further studies with larger sample sizes and randomized controlled designs are needed to confirm these findings and determine their applicability across different hemodialysis settings.

DECLARATION OF CONFLICTING INTEREST

The authors declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

FUNDING

Nothing to declare

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to all participants in this study. The authors gratefully acknowledge the invaluable support of the Hemodialysis Unit team at Government Hospital Prof. Dr. M.A. Hanafiah SM Batusangkar, West Sumatera, for their cooperation and assistance throughout the study process. Sincere appreciation is also extended to all hemodialysis patients who generously participated in this research and shared their experiences, without whom this study would not have been possible. The authors also thank the Institutional Review Board of Fort De Kock Ethical Committee for granting ethical approval and providing guidance during the research process. Appreciation is given to colleagues and nursing staff who contributed to participant recruitment, intervention implementation, and data collection.

AUTHOR'S CONTRIBUTION

IRK: Conceptualization, Methodology, Investigation, Data Curation, Writing – Original Draft, Writing – Review & Editing.
DS: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing – Original Draft, Writing – Review & Editing.
FR: Formal Analysis, Writing – Original Draft, Writing – Review & Editing.

ETHICAL CONSIDERATION

Ethical approval was obtained from the Ethical Committee of Fort De Kock University (Approval Number: 495/KEPK/X/2022).

DATA AVAILABILITY STATEMENT

The dataset generated during and analyzed during the current study is available at https://doi.org/10.6084/m9.figshare.31440850 more information and question can directly contact the corresponding author.

REFERENCES

Abdoli, S., Rahzani, K., Safaie, M., & Sattari, A. (2012). A randomized controlled trial: the effect of guided imagery with tape and perceived happy memory on chronic tension-type headache. *Scandinavian Journal of Caring Sciences*, *26*(2), 254–261. https://doi.org/10.1111/j.1471-6712.2011.00926.x

Acar, K., & Aygin, D. (2019). Efficacy of Guided Imagery for Postoperative Symptoms, Sleep Quality, Anxiety, and Satisfaction Regarding Nursing Care: A Randomized Controlled Study. *Journal of PeriAnesthesia Nursing*, *34*(6), 1241–1249. https://doi.org/10.1016/j.jopan.2019.05.006

Afshar, M., Mohsenzadeh, A., Gilasi, H., & Sadeghi-Gandomani, H. (2018). The effects of guided imagery on state and trait anxiety and sleep quality among patients receiving hemodialysis: A randomized controlled trial. *Complementary Therapies in Medicine*, *40*, 37–41. https://doi.org/10.1016/j.ctim.2018.07.006

Aghakhani, N., Faraji, N., Alinejad, V., Goli, R., & Kazemzadeh, J. (2022). The effect of guided imagery on the quality and severity of pain and pain-related anxiety associated with dressing changes in burn patients: A randomized controlled trial. *Burns*, *48*(6), 1331–1339. https://doi.org/10.1016/j.burns.2021.11.020

Anisah, I. N., & Maliya, A. (2021). Efektivitas Relaksasi Benson Terhadap Kecemasan Pasien Yang Menjalani Hemodialisa. *Jurnal Berita Ilmu Keperawatan*, *14*(1), 57–64. https://doi.org/10.23917/bik.v14i1.12226

Beizaee, Y., Rejeh, N., Heravi-Karimooi, M., Tadrisi, S. D., Griffiths, P., & Vaismoradi, M. (2018). The effect of guided imagery on anxiety, depression and vital signs in patients on hemodialysis.

Complementary Therapies in Clinical Practice, *33*, 184–190. https://doi.org/10.1016/j.ctcp.2018.10.008

Bode, A. S., & Tordoir, J. H. M. (2013). Vascular access for hemodialysis therapy. *Studies in Computational Intelligence*, *404*. https://doi.org/10.1007/978-3-642-27458-9_5

Bozkurt-Duman, C., Arici-Türk, H., Erbay-Dalli, Ö., & Yildirim, Y. (2025). The effectiveness of guided imagery on psychological outcomes and quality of life in cancer patients: a systematic review and meta-analysis. *Supportive Care in Cancer*, *33*(11), 952. https://doi.org/10.1007/s00520-025-10016-8

Cole, L. (2021). The Impact of Guided Imagery on Pain and Anxiety in Hospitalized Adults. *Pain Management Nursing*, *22*(4). https://doi.org/10.1016/j.pmn.2021.02.007

Desnita, R. (2018). Pemijatan Pada Titik LI-4 Untuk Mengurangi Nyeri Kanulasi AV-Fistula Pada Pasien Hemodialisis. *Jurnal Keperawatan Muhammadiyah*, *3*(1). https://doi.org/10.30651/jkm.v3i1.1571

Fareed, L., Saeed, A. A., & Ahmed, Y. A. (2025). Pain And Anxiety During AV Fistula Cannulation Among Hemodialysis Patients. *Biological and Clinical Sciences Research Journal*, *6*(4), 27–30. https://doi.org/10.54112/bcsrj.v6i4.1647

Febtrina, R., & Febriana, W. (2019). Guided Imagery Relaxation Techniques Reduce Patient's Pain Post Attack Heart [Teknik Relaksasi Imajinasi Terbimbing (Guided Imagery) Menurunkan Nyeri Pasien Pasca Serangan Jantung]. *Nursing Current: Jurnal Keperawatan*, *5*(2), 41. https://doi.org/10.19166/nc.v5i2.1703

Hadjibalassi, M., Lambrinou, E., Papastavrou, E., & Papathanassoglou, E. (2018). The effect of guided imagery on physiological and psychological outcomes of adult ICU patients: A systematic literature review and methodological implications. *Australian Critical Care*, *31*(2), 73–86. https://doi.org/10.1016/j.aucc.2017.03.001

Hansen, J., Molsted, S., Ekholm, O., & Hansen, H. (2020). Pain prevalence, localization, and intensity in adults with and without copd: Results from the danish health and morbidity survey (a self-reported survey). *International Journal of COPD*, *15*. https://doi.org/10.2147/COPD.S275234

Hartshorn, G., Browning, M., Chalil Madathil, K., Mau, F., Ranganathan, S., Todd, A., Bertrand, J., Maynard, A., McAnirlin, O., Sindelar, K., Hernandez, R., & Henry Gomez, T. (2022). Efficacy of virtual reality assisted guided imagery (VRAGI) in a home setting for pain management in patients with advanced cancer: protocol for a randomised controlled trial. *BMJ Open*, *12*(12), e064363. https://doi.org/10.1136/bmjopen-2022-064363

Ibrahim, M. B., Abdelaal Badawi, S. E., & Alameri, R. A. (2022). Assessment of Pain and Anxiety During Arteriovenous Fistula Cannulation Among Hemodialysis Patients: A Cross-Sectional Study in Saudi Arabia. *Journal of Multidisciplinary Healthcare*, *Volume 15*, 705–718. https://doi.org/10.2147/JMDH.S344256

Indonesian Renal Registry. (2024). *17th Annual Report of the Indonesian Renal Registry*.

Iryawati, D., Efiyanti, C., Yurianingsih, Fadlurrahman Zuhair, C., Manggala Putra, M., Wahyu Aryanto, N. J., & Nurlaela, D. (2025). Trends in hemodialysis-related search interest in Indonesia: a decade Google Trends analysis. *Medical and Health Science Journal*, *9*(1), 46–53. https://doi.org/10.33086/mhsj.v9i1.7952

Jochimsen, K. N., Archer, K. R., Pollini, R. A., Parker, R. A., Enkhtsetseg, N., Jacobs, C. A., & Vranceanu, A. M. (2024). A Mind–Body Intervention to Improve Physical Activity for Patients with Chronic Hip-Related Pain: Protocol for a Mixed Methods Study. *Journal of Personalized Medicine*, *14*(5), 499. https://doi.org/10.3390/jpm14050499

Juwita, L., & Kartika, I. R. (2019). Pengalaman Menjalani Hemodialisa Pada Pasien Gagal Ginjal Kronis. *Jurnal Endurance*, *4*(1), 97. https://doi.org/10.22216/jen.v4i1.3707

Kamila, H. S., Maliya, A., & Kristini, P. (2023). The Effect of Music Therapy on Anxiety in Hemodialysis Patients with Kidney Failure : A case report. *Jurnal Berita Ilmu Keperawatan*, *16*(1), 143–149. https://doi.org/10.23917/bik.v16i1.797

Kartika, I. R., Rezkiki, F., & Nugraha, H. (2022). Guided Imagery Pain Assessment, Stimulation and Healing Application (PASHA): Upaya Menurunkan Nyeri Menstruasi pada Remaja. *Jurnal Institut Riset Dan Publikasi Indonesia (IRPI) SENTIMAS: Seminar Nasional Penelitian Dan Pengabdian Masyarakat*, *1*(1).

Kartika, I. R., Rezkiki, F., & Putri, W. A. (2023). Terapi Guided Imagery Berbasis Aplikasi Pasha (Pain Assessment, Stimulating and Healing Application) Dalam Menurunkan Nyeri Post Operasi. *Human Care Journal*, *8*(3), 523–529.

Kasi, S. M. (2025). Effectiveness of guided imagery in terms of cancer pain and perceived stress among patients with cancer. *Wisdom Journal of Science and Technology*, *1*(2), 91–97. https://doi.org/10.64848/WJST.1.2.2025.91-97

Kassim, M. A. K., Pantazi, A. C., Nori, W., Tuta, L. A., Balasa, A. L., Mihai, C. M., Mihai, L., Frecus, C. E., Lupu, V. V., Lupu, A., Andrusca, A., Iorga, A. M., Litrin, R. M., Ion, I., Ciciu, E., Chirila, S. I., & Chisnoiu, T. (2023). Non-Pharmacological Interventions for Pain Management in Hemodialysis: A Narrative Review. *Journal of Clinical Medicine*, *12*(16), 5390. https://doi.org/10.3390/jcm12165390

Kong, J. (2024). Brain and body: Implanting a placebo in the brain to alleviate pain. *Current Biology*, *34*(19), R904–R906. https://doi.org/10.1016/j.cub.2024.08.055

Krau, S. D. (2020). The Multiple Uses of Guided Imagery. *Nursing Clinics of North America*, *55*(4), 467–474. https://doi.org/10.1016/j.cnur.2020.06.013

Lawson, J. H., Niklason, L. E., & Roy-Chaudhury, P. (2020). Challenges and novel therapies for vascular access in haemodialysis. In *Nature Reviews Nephrology* (Vol. 16, Issue 10). https://doi.org/10.1038/s41581-020-0333-2

Li, M.-J., Liu, H.-Y., Zhang, Y.-Q., Li, S.-R., Zhang, J.-H., & Li, R. (2025). Global burden of chronic kidney disease and its attributable risk factors (1990-2021): an analysis based on the global burden of disease study. *Frontiers in Endocrinology*, *16*. https://doi.org/10.3389/fendo.2025.1563246

Mutiara Dewi, I. A., & Masfuri, M. (2021). Inhalasi Aromaterapi Lavender terhadap Komplikasi Hemodialisis pada Pasien Gagal Ginjal Kronis. *Jurnal Keperawatan Silampari*, *5*(1), 348–362. https://doi.org/10.31539/jks.v5i1.2956

Parizad, N., Goli, R., Faraji, N., Mam-Qaderi, M., Mirzaee, R., Gharebaghi, N., Baghaie, R., Feizipour, H., & Haghighi, M.-M. (2021). Effect of guided imagery on anxiety, muscle pain, and vital signs in patients with COVID-19: A randomized controlled trial. *Complementary Therapies in Clinical Practice*, *43*, 101335. https://doi.org/10.1016/j.ctcp.2021.101335

Peralta, R., Sousa, L., & Cristovão, A. F. (2023). Cannulation Technique of Vascular Access in Hemodialysis and the Impact on the Arteriovenous Fistula Survival: Systematic Review and Meta-Analysis. *Journal of Clinical Medicine*, *12*(18), 5946. https://doi.org/10.3390/jcm12185946

Perry, & Potter. (2016). *Fundamentals of Nursing* (9th ed.). Stokert Hall.

Sadigova, E., Yalcin, A., & Ozkurt, S. (2020). Pain Assessment in Hemodialysis Patients. *Cureus*. https://doi.org/10.7759/cureus.6903

Salimi Akinabadi, A., Khari, S., Azizmohammad Looha, M., & Zandi, M. (2024). The Effect of Guided Imagery and Progressive Muscle Relaxation on Sedation in Patients Undergoing Noninvasive Mechanical Ventilation. *Journal of Pain & Palliative Care Pharmacotherapy*, *38*(3), 217–232. https://doi.org/10.1080/15360288.2024.2339211

Saputra, M., & Nasution, H. A. . (2021). Kompres Dingin Titik L 1-4 Kontra Lateral Tangan Menekan Respon Nyeri Selama Invasif Arteriovenous Fistula (AVF) Pasien Hemodialisa. *Jurnal Ilmiah Perawat Manado (Juiperdo)*, *8*(02), 01–20. https://doi.org/10.47718/jpd.v8i02.1175

Sharifnia, A. M., Chu, G., Manias, E., Davidson, P. M., & Fernandez, R. (2025). Comparative analysis of the effectiveness of pharmacological and non-pharmacological interventions on arteriovenous fistula cannulation-related pain in patients receiving hemodialysis: A systematic review and network meta-analysis. *International Journal of Nursing Studies*, *169*, 105123. https://doi.org/10.1016/j.ijnurstu.2025.105123

Sulistiyawati, S., Muhith, A., & Mahyuvi, T. (2024). Addressing Anxiety Problems in Hospital Patients with Guided Imagery Therapy: A Systematic Review. *Journal of Applied Nursing and Health*, *6*(2), 295–302. https://doi.org/10.55018/janh.v6i2.258

Utami, A. D., & Kartika, I. R. (2018a). Terapi Komplementer Guna Menurunkan Nyeri Pasien Gastritis: Literatur Review. *REAL in Nursing Journal (RNJ)*, *1*(3), 123–132. https://ojs.fdk.ac.id/index.php/Nursing/index

Utami, A. D., & Kartika, I. R. (2018b). Terapi Komplementer Terhadap Penurunan Nyeri Pada Pasien Gastritis: A Literatur Review. *REAL in Nursing Journal*, *1*(3), 123. https://doi.org/10.32883/rnj.v1i3.341

Zeidan, F., Grant, J. A., Brown, C. A., McHaffie, J. G., & Coghill, R. C. (2012). Mindfulness meditation-related pain relief: Evidence for unique brain mechanisms in the regulation of pain. *Neuroscience Letters*, *520*(2), 165–173. https://doi.org/10.1016/j.neulet.2012.03.082

Zemla, K., Sedek, G., Wróbel, K., Postepski, F., & Wojcik, G. M. (2023). Investigating the Impact of Guided Imagery on Stress, Brain Functions, and Attention: A Randomized Trial. *Sensors*, *23*(13), 6210. https://doi.org/10.3390/s23136210