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The Effect of Guided Imagery on Postoperative Pain Management in Patients Undergoing Lower Extremity Surgical Operations

A Randomized Controlled Trial

Leyla Zengin Aydın ▼ Aysel Doğan

Guided imagery distracts patients from disturbing feelings and thoughts, positively affects emotional well-being, and reduces pain by producing pleasing mental images. This study aimed to determine the effects of guided imagery on postoperative pain management in patients undergoing lower extremity surgery. This randomized controlled study was conducted between April 2018 and May 2019. This study included 60 patients who underwent lower extremity surgery. After using guided imagery, the posttest mean Visual Analog Scale score of patients in the intervention group was found to be 2.56 (1.00 ± 6.00), whereas the posttest mean score of patients in the control group was 4.10 (3.00 ± 6.00), and the difference between the groups was statistically significant ($p < .001$). Guided imagery reduces short-term postoperative pain after lower extremity surgery.

Introduction

The International Association for the Study of Pain defines pain as a hurtful experience (Everson et al., 2020; Schroeder et al., 2016) that is affected, to different degrees, by biological, psychological, and social factors (Bordi, 2018; Jenkins et al., 2008). Postoperative pain is defined as acute pain that begins with surgical trauma and gradually decreases (Bordi, 2018; Topcu & Findik, 2012). The location and duration of surgery, preoperative physical and psychological preparation, and quality of postoperative care affect the level of postoperative pain (Darnall, 2016; Rognstad et al., 2012). As pain is multidimensional, approaches that combine pharmacological and nonpharmacological methods should be used to treat it holistically, addressing the patient's body, mind, and spirit (Demir, 2012; Topcu & Findik, 2012).

Chou et al. reported that 80% of patients experienced acute postoperative pain and 75% described their pain as moderate, severe, or highly severe (Chou et al., 2016). Management of postoperative orthopaedic pain is challenging because the surgical procedure generally involves significant muscle and skeletal tissue repair or reconstruction (Pasero & McCaffery, 2007). Additionally, many of these patients have a significant history of managing chronic pain before surgery, and may have accompanying anxiety and concerns regarding pain control. Unmanaged postoperative pain may have physiological effects, such as insufficient respiration, cardiac problems, and delayed wound healing, and complementary therapies have been recommended as adjuncts in the treatment of pain in patients undergoing orthopaedic surgery (Carpenter et al., 2017; Gonzales et al., 2010; Thomas & Sethares, 2010; Tracy, 2010). A variety of mind–body therapy techniques have proven efficacious in decreasing anxiety, stress, and pain (Broadbent et al., 2012; Dal et al., 2012).

Owing to the high severity of pain in patients undergoing orthopaedic surgery of the lower extremities, the use of analgesic drugs is more prevalent than that in other surgical procedures. According to Lin (2012), "Pain is a multilevel phenomenon that includes physiological responses, feelings, emotions, cognitions and behaviours" (Lin, 2012). This suggests that a

Leyla Zengin Aydin, PhD, Department of Nursing, Ataturk Faculty of Health Sciences, Dicle University, Diyarbakır, Turkey.

Aysel Doğan, PhD, Department of Nursing, Faculty of Health Sciences, Toros University, Mersin, Turkey.

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Correspondence: Leyla Zengin Aydın, PhD, Department of Nursing, Ataturk Faculty of Health Sciences, Dicle University, Diyarbakır, Turkey (leyla_zen@hotmail.com).

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multidimensional approach that addresses the nonphysiological aspects of pain in addition to its physiological components may be more effective. Pain should be treated holistically to address the patient's body, mind, and spirit (Lin, 2012). Combining analgesics with complementary approaches, such as the use of biofeedback, hypnosis, guided imagery, yoga, relaxation therapy, massage, and reiki, has been shown to reduce pain and anxiety. Mind–body therapy enhances the interactions between mind and bodily functions, induces relaxation, and improves overall health and well-being (Casarin et al., 2019; Cepeda et al., 2006; Engwall & Duppils, 2009; Gallagher et al., 2018; Gureje et al., 2015; Pellino et al., 2005).

Carpenter et al.'s integrative review of the effectiveness of guided imagery for pain management in postoperative patients found that it may be an effective tool for reducing pain in postoperative orthopaedic patients (Carpenter et al., 2017). An integrative review by Skeens showed that guided imagery can be used in children and adults to create feelings of empowerment and relaxation; increase endorphins; and decrease anxiety, pain, blood loss, and the use of pain medications (Skeens, 2017). By refocusing the mind, guided imagery affects the limbic system, facilitating physiological relaxation by lowering the sympathetic responses and increasing the parasympathetic nervous system responses. The outcomes of guided imagery include lowered stress, pain, or other negative feelings, thereby enhancing a sense of calm, easing tension, and lifting one's mood.

Guided imagery with accompanying deep breathing facilitates relaxation and the progressive release of muscle tension. Imagery involves the mental reconstruction of a scene or image linked to serenity, and functions to free the individual from negative thoughts. This image may be one that a person knows or imagines. The aim is to activate multiple senses when creating the imagery. The senses include sight, sound, smell, and taste. The more specific the imagery, the more helpful it will be. The goal is to solidly visualize a place so that it "removes" the person from their stressful circumstance and places them in a controlled situation that is calming, relaxing, and safe (Antall & Kresevic, 2004; Bruscia, 2014). These positive thoughts are beneficial for relieving anxiety and decreasing pain symptoms (Lewandowski, 2004; Roffe et al., 2005).

A literature review revealed studies investigating the effects of guided imagery on pain management, anxiety, sleep quality, and patient satisfaction in various surgical fields (Acar & Aygin, 2019; Allred et al., 2010; Álvarez-García & Yaban, 2020; Singh & Dalmar, 2014); however, the level of evidence was not high. Furthermore, only a limited number of studies have investigated the effects of guided imagery as a complementary approach to the use of analgesic drugs in postoperative pain management in patients undergoing lower extremity orthopaedic surgical operations. In a meta-analysis conducted in 2020, Álvarez-García and Yaban stated that guided imagery was effective in many studies, but different protocols were applied in these studies; therefore, different randomized controlled trials are needed to identify a dose–response relationship (Álvarez-García & Yaban, 2020). Therefore, this study aimed to determine the effects of guided imagery on postoperative pain management in patients undergoing lower extremity orthopaedic surgery.

Methods

Design

The study was conducted with patients undergoing lower extremity orthopaedic surgical operations between April 2018 and May 2019. A randomized controlled trial examining a population from a hospital in southern Turkey was conducted.

Participants and Sampling

The inclusion criteria were as follows: (a) lower extremity surgery at or over the age of 18 years, (b) Visual Analog Scale (VAS) scores of 4 or more, (c) ability to speak Turkish, (d) received spinal anesthesia, and (e) willingness to participate in the study. The exclusion criteria were as follows: (a) chronic disease (such as diabetes or hypertension), (b) psychiatric illness, and (c) prior receipt of guided imagery intervention before hospitalization (see Figure 1).

The software program G-Power 3.0.10 was used to estimate the sample size (Faul et al., 2008). To determine the necessary sample size, the mean and standard deviation scale scores used by Baird et al. (2010) in their study of patients with osteoarthritis were used. The required sample size for the study was determined to be 70 patients, based on G-Power analysis using a two-tailed significance level, effect size of 0.76, error rate of 5%, and confidence interval of 95%, with 88% power to represent the population. However, 80 patients were included in the study sample, allowing for a 12.5% dropout rate.

A total of 107 patients underwent lower extremity orthopaedic surgery at the hospital between April 2018 and May 2019. Initially, 84 patients who met the inclusion criteria were included in this study. Four individuals had pain of less than 4 and were excluded from participation, leaving 80 patients with postoperative pain.

After the initiation of the study, five patients from both the intervention and control groups withdrew their consent. In the follow-up phase of the study, four patients from the intervention group withdrew consent and one patient was transferred to the intensive care unit (ICU) because their condition deteriorated. In the control group, three patients withdrew consent and two were transferred to the ICU. The study was completed by 60 patients, including 30 in the control group and 30 in the intervention group. A flowchart of the study design is shown in Figure 1.

Data Collection Instruments

Data were collected using descriptive characteristics of the patients and the Visual Analog Scale (VAS).

Descriptive Characteristics of the Patients

This form was prepared by the researchers to collect patient descriptive characteristics, such as age, sex,

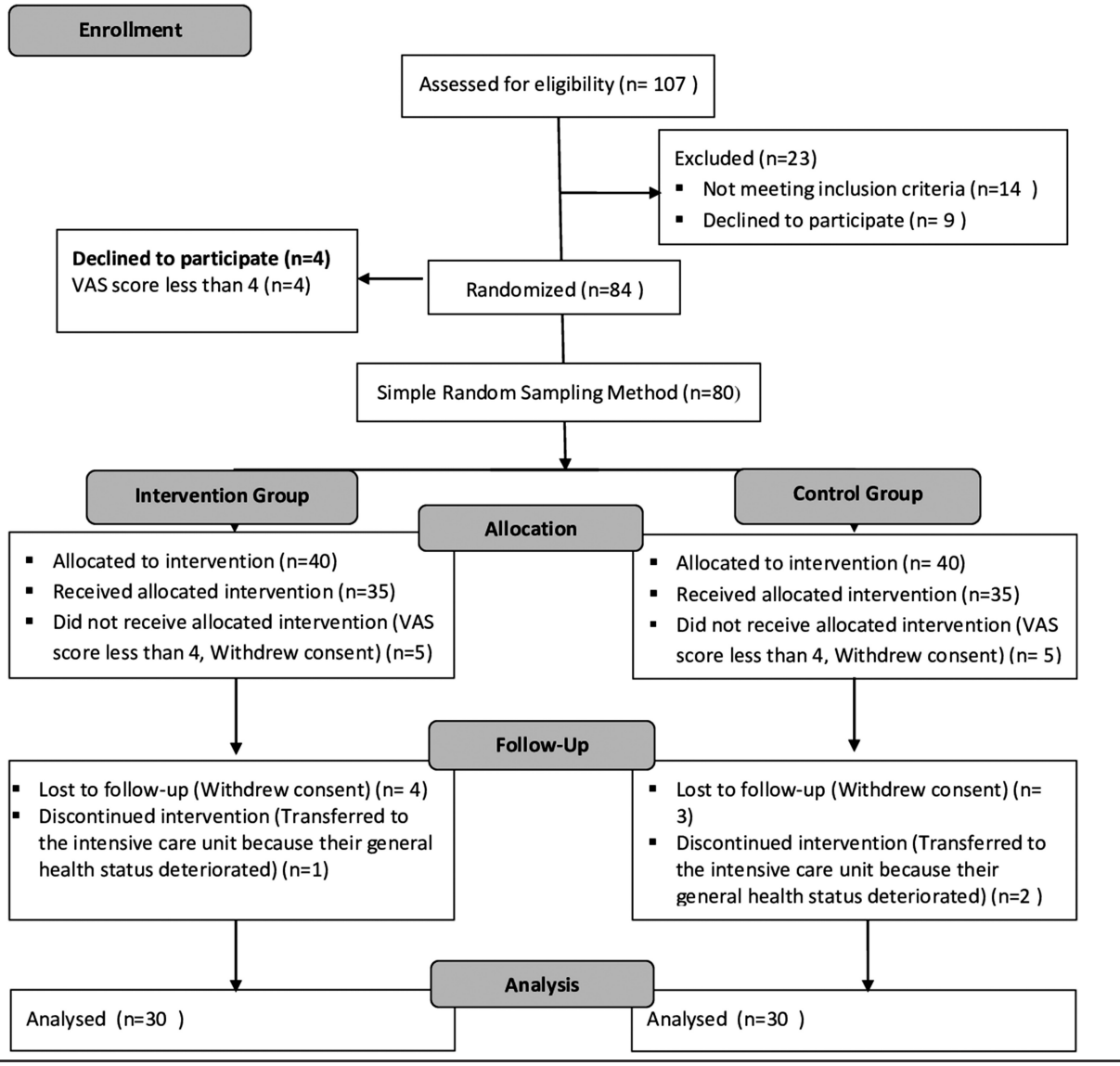

FIGURE 1. Participant enrollment flowchart.

marital status, educational level, employment status, type of orthopaedic surgery, and income level (Allred et al., 2010; Chou et al., 2016; Topcu & Findik, 2012; Singh & Dalmar, 2014).

Visual Analog Scale

The VAS is used to record the severity of pain and has been accepted in the international literature as reliable and easily applicable. The VAS was initially tested for validity and reliability by Price et al. (1983). It has been reported to be valid and reliable in evaluating postoperative pain (Ahearn, 1997; Aslan, 2004; Aslan et al., 2018; Doğan et al. 2010; Ismail et al., 2015; Kane et al., 2005; Li et al., 2007). The VAS is also considered a valid and sensitive tool for measuring acute pain (Breivik et al., 2000).

The VAS typically takes the form of a 10-cm-long horizontal or vertical line, which is labeled "no pain" at one end and "unbearable pain" at the other. Patients were asked to record their current pain levels on this scale. In patients who cannot physically mark the scale, pain level may be measured by moving the pen from the lowest to the highest level on the VAS, where the intensity of pain is measured by placing a cross when the patient nods (Grant et al., 1999; Hjermstad et al., 2011; Kane et al., 2005).

PROCEDURE

Participants were informed of the research during the postoperative period. Written and verbal informed consent was obtained from 80 patients who voluntarily agreed to participate in this study. Patients included in the study were divided into two groups using a computer-aided simple random sampling method to ensure that the groups included the same number of participants. The two group lists were put into either of two envelopes; the researchers randomly selected one of the two envelopes as the intervention group and the other as the control group (see Figure 1).

Patients were informed that they could leave the study at any time. Guided imagery was administered outside of visiting hours to avoid noise. Patients'

relatives were asked to leave the room during guided imagery administration.

Intervention

Patients in the control group received standard nursing care and routine analgesia protocols. Pain levels of patients were evaluated using the VAS. No intervention was applied to patients in the control group. The VAS was readministered to the control group after 30 minutes.

Patients in the intervention group received standard nursing care and routine analgesia protocols. Pain levels of patients were evaluated using the VAS. Subsequently, patients in the intervention group underwent guided imagery. The VAS was readministered to the intervention group 30 minutes after guided imagery.

Guided Imagery Intervention

A CD consisting of music and natural photographs was prepared by a music expert based on the researcher's instructions. The music recordings were 13 minutes 25 seconds in length, had a tempo of 60–70 beats per minute, and were composed of soothing music and natural sounds, such as falling water and chirping birds, intended to reduce pain in patients (Alam et al., 2016; Bruscia, 2014; Dileo & Bradt, 2005, 2007; Jallo et al., 2013; Prabu & Subhash, 2015; Rossman, 2010). Studies have shown that music has calming features, reduces patient anxiety, and induces relaxation (Alam et al., 2016; Allred et al., 2010; Antall & Kresevic, 2004; Good, 1995; Heitz et al., 1992; MacClelland, 1982).

Half of the patient rooms in the clinic where the study was conducted were single-occupant rooms. Patients participating in the study were placed in these single rooms; during guided imagery, the room was silent and calm. After providing information about the intervention (i.e., guided imagery), the researcher asked the intervention group patients to imagine a moment without pain, to feel calm and peaceful. Patients were asked to imagine themselves at the top of a flight of 20 stairs. They were instructed to start descending the stairs when they wanted to feel happy and had no pain. At each step, they were asked to gradually feel that their whole body was relaxing, starting from their toes, and working up to the head. Patients were given 2–3 minutes to imagine being in a pleasant situation of their choice. Then participants were asked to imagine that they were at the bottom of the same flight of stairs and that they would now ascend the stairs. With each stair they climbed up, they were asked to imagine a growing sense of power throughout their entire body, starting from their toes and moving up to the head. Climbing continued until Step 20. When patients reached the 20th step in their imaginations, they said that their entire body was relaxed and that they were very strong. At this point the guided imagery application was terminated.

Data Collection

Data were collected through face-to-face interviews between April 2018 and May 2019. Pain levels of patients were evaluated using the VAS. The study included patients with a VAS pain score of 4 or more. Pretest data were collected from both the intervention and control groups using both the Introductory Information Form and the VAS. After applying standard nursing care and routine analgesia protocols to the patients in the intervention group, patients with pain were then taken through the guided images. The VAS was readministered to the intervention group 30 minutes after guided imagery. The control group received no intervention, but the VAS was readministered to the control group 30 minutes after the first pain assessment.

Ethical Statement

Ethical committee approval for the study was obtained in 2018 from the noninterventional research ethics board of a university. Written permission was obtained from the Health Directorate of 2018. Written and verbal consent was obtained from all participants.

Data Analysis

Coding and statistical analyses of the data were performed using SPSS 16. The Shapiro–Wilk test was used to test the normality of data distribution. As the data showed a nonnormal distribution, nonparametric tests were used. Percentages, means, standard deviations, χ^2 test, Kruskal–Wallis test, and Wilcoxon test were used to analyze the data. The data were tested at a significance level of .05. There were no statistically significant differences between the intervention and control groups in terms of age, sex, marital status, educational level, employment status, income status, previous surgical operations, or disease diagnosis ($p > .05$) (see Table 1). The results showed that the two groups were similar in their descriptive characteristics.

Results

Descriptive Characteristics of Patients

The mean age of patients in the intervention group was 50.00 ± 1.55, 63.3% were male, 80% were married, 73.3% had primary education, and 53.3% had undergone no prior surgical intervention. The mean age of patients in the control group was 49.00 ± 12.68, 66.7% were male, 80% were married, 76.7% had primary education, 43.3% had undergone no prior surgical operation, and 36.7% had a diagnosis of meniscus (see Table 1). As illustrated in Table 1, there was no statistically significant difference between the intervention and control groups in terms of demographic variables ($p > .05$).

VAS Scores of Patients

Table 2 shows the intergroup comparison of the mean VAS pre- and posttest scores of patients in the intervention and control groups. The mean pretest VAS score of patients in the intervention group was 8.46 (5.00 ± 10.00), whereas the mean pretest score of patients in the control group was 8.70 (7.00 ± 10.00). The difference between the pretest scores of the groups was not significant ($p > .05$).

Table 1. Comparison of Intervention and Control Groups

Control Variables	Intervention Group (n = 30)		Control Group (n = 30)		χ^2	p
	n	%	n	%		
Age (years)						
18–30	7	23.3	6	20.0	2.482	.648
31–41	4	13.3	5	16.7		
≥42	19	63.3	19	63.3		
Gender						
Female	11	36.7	10	33.3	3.517	.61
Male	19	63.3	20	66.7		
Marital status						
Married	24	80.0	24	80.0	1.154	.283
Single	6	20.0	6	20.0		
Education level						
Illiterate	8	26.7	7	23.3	0.716	.392
Primary education level or above	22	73.3	23	76.7		
Employment status						
Unemployed	8	26.7	7	23.3	1.224	.269
Employed	22	73.3	23	76.7		
Income status						
Low	23	76.7	21	70.0	0.719	.397
Middle	7	23.3	9	30.0		
Having undergone a previous surgical operation						
No	16	53.3	13	43.3	2.039	.153
Yes	14	46.7	17	56.7		
Diagnosis[a]						
Knee prosthesis	3	10.0	4	13.3	13.340	.148
Hip prosthesis	8	26.7	7	23.3		
Leg fracture	7	23.3	8	26.7		
Meniscus	12	40.0	11	36.7		

[a]Information was taken from the patient files.

The VAS was readministered to the intervention group 30 minutes after guided imagery. The VAS was readministered to the control group 30 minutes after the first pain assessment. The mean posttest score of patients in the intervention group was 2.56 (1.00 ± 6.00), whereas the mean posttest score of patients in the control group was 4.10 (3.00 ± 6.00). Differences between the posttest scores of the groups were statistically significant ($p < .05$).

Table 3 shows the intragroup comparison results of the mean pre- and posttest scores of patients in the intervention and control groups. The mean pretest VAS score of patients in the intervention group decreased from 8.46 (5.00 ± 10.00) to 2.56 (1.00 ± 6.00). The difference between pre- and posttest scores in the intervention group was statistically significant ($p < .001$). The mean pretest VAS score of patients in the control group decreased from 8.70 (7.00 ± 10.00) to 4.10 (3.00

Table 2. Intergroup Comparison of the Mean Pretest and Posttest Scores of Patients in the Intervention and Control Groups

	Application Times of the Scale	Intervention Group (n = 30) $\bar{X}$ (Min–Max)	Control Group (n = 30) $\bar{X}$ (Min– Max)	Test and Significance	
				t[a]	p
VAS score	Pretest	8.46 (5.00–10.00)	8.70 (7.00–10.00)	−0.504	.614
	Posttest	2.56 (1.00–6.00)	4.10 (3.00–6.00)	−4.375	.001*

Note. VAS = Visual Analog Scale.
[a]Mann–Whitney *U* test.
*Statistically significant at $p < .001$.

Table 3. Intragroup Comparison of the Mean Pretest and Posttest Scores of Patients in the Intervention and Control Groups

VAS Score	Pretest $\bar{X}$ (Min–Max)	Posttest $\bar{X}$ (Min–Max)	Test and Significance z^a	p
Intervention group (n = 30)	8.46 (5.00–10.00)	2.56 (1.00–6.00)	−4.816	.001*
Control group (n = 30)	8.70 (7.00–10.00)	4.10 (3.00–6.00)	−4.810	.001*

Note. VAS = Visual Analog Scale.
[a]Wilcoxon test.
*Statistically significant at $p < .001$.

± 6.00). The difference between the pre- and posttest scores of the control group was also significant ($p < .001$).

Discussion

In this study, the use of guided imagery in patients who underwent lower extremity surgery was an effective method for managing postoperative pain. Guided imagery was used as a complementary therapy in conjunction with the routine analgesia protocol to support the management of postoperative pain in patients in the intervention group. There was no statistically significant difference between the pretest VAS scores of patients in the intervention and control groups. However, patients in the guided imagery group had lower posttest VAS scores than those in the control group.

The findings of this study are similar to those of previous studies. In a randomized controlled study by Forward et al. (2015), guided imagery was used with individuals who underwent elective total hip or knee replacement. They found that guided imagery had a positive effect on both pain and anxiety (Forward et al., 2015). Baird et al. (2010) found that guided imagery reduced postoperative pain and increased mobility in osteoarthritis. Similar to the results of our study, a randomized controlled study by Antall and Kresevic (2004) found that patients older than 55 years who were scheduled for hip or knee prosthetic surgery and received guided imagery experienced reduced pain and anxiety and decreased length of stay.

In a systematic review that included 12 randomized controlled studies, the effectiveness of psychological interventions in patients undergoing total knee replacement was assessed. However, the included studies used guided imagery at different times and frequencies, such as before and after surgery (Whale et al., 2019). The authors emphasized the need for more evidence-based research on the effectiveness of interventions that use mind–body interactions in pain management after total knee prosthetic surgery. In our study, guided imagery was used once after surgery to reduce postoperative pain and was determined to be effective. In contrast to our findings, in their study of 48 patients diagnosed with fibromyalgia, Menzies et al. (2006) determined that the implementation of guided imagery alongside standard care improved functional status and feelings of self-efficacy, but was not effective for pain (Menzies et al., 2006).

Limitations of the Study

Data were collected from patients who underwent surgery at a hospital affiliated with the Turkish Ministry of Health. Therefore, the generalizability of our results is limited. Another limitation of this study was that patients had undergone a range of different surgeries, as such postoperative medication protocols would have also varied. Confidence in the results would have been strengthened had the sample size been larger. In this study, the short-term results of guided imagery were examined. However, its long-term effects on pain reduction have not been studied.

Implications for Practice

After lower extremity orthopaedic surgery, guided imagery may be used as an adjunct, nonpharmacological approach to pain management. Given its effectiveness in the management of pain, consideration should be given to including guided imagery and other complementary therapies in pre- and in-service training programs. We recommend that orthopaedic nurses continue to conduct evidence-based studies on guided imagery to expand the knowledge base on this topic.

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