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Effectiveness of Mind-Body Interventions Delivered by Nurses in Improving Psychological Well-being and Surgical Recovery: A Meta-Analysis

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A B S T R A C T

Surgical patients often experience psychological distress that can hinder their recovery. Mind-body interventions (MBIs) delivered by nurses, such as guided imagery and mindfulness exercises, may improve psychological well-being and surgical recovery. This meta-analysis examined the effectiveness of nurse-delivered MBIs on adult surgical patients. A systematic search of PubMed, CINAHL, PsycINFO, and Cochrane Library databases was conducted from January 2013 to November 2024. Randomized controlled trials (RCTs) examining the effects of nurse-delivered MBIs on adult surgical patients were included. Primary outcomes were anxiety, depression, and pain. Secondary outcomes included length of hospital stay, postoperative complications, and medication usage. Random-effects models were used to calculate pooled effect sizes (Hedges' g). Six RCTs met the inclusion criteria, comprising 785 participants. Meta-analysis revealed that nurse-delivered MBIs significantly reduced anxiety ($g = -4.09$, 95% CI [-6.25, -1.93], $p = 0.0002$) and depression ($g = -3.40$, 95% CI [-4.96, -1.85], $p < 0.00001$) compared to standard care. Significant reductions in postoperative pain ($g = -1.77$, 95% CI [-2.10, -1.44], $p < 0.00001$) were also observed. No significant differences were found for length of hospital stay or postoperative complications. In conclusion, nurse-delivered MBIs effectively improve psychological well-being and reduce postoperative pain in adult surgical patients, supporting their integration into routine surgical care.

1. Introduction

The perioperative period, encompassing the preoperative, intraoperative, and postoperative phases of surgery, is often a time of significant psychological distress for patients. This period, characterized by anticipation, uncertainty, and physical discomfort, can evoke a range of emotions, including anxiety, fear, and depression. The anticipation of surgery, with its inherent risks and potential complications, can trigger anxiety and fear in patients. The surgery itself, even with modern advancements in anesthesia and surgical techniques, can be a physically and emotionally traumatic experience. The recovery process, often accompanied by pain, limited mobility, and dependence on others, can lead to feelings of vulnerability and depression. These psychological factors can have a profound impact on a patient's surgical recovery. Anxiety and fear can increase physiological arousal, leading to elevated heart rate, blood pressure, and muscle tension. This heightened physiological state can interfere with the body's natural healing processes, potentially delaying wound healing and increasing the risk of complications. Depression, characterized by feelings of sadness,

hopelessness, and loss of interest, can also impede recovery by reducing motivation and adherence to treatment regimens. Moreover, psychological distress can exacerbate the perception of pain. Pain is a complex experience influenced by both physical and psychological factors. When patients experience anxiety or depression, their perception of pain may be amplified, leading to increased suffering and a greater reliance on pain medications. This heightened pain perception can further hinder recovery by limiting mobility, delaying rehabilitation, and increasing the risk of chronic pain.[1-3]

Traditional approaches to managing psychological distress in surgical patients often rely on pharmacological interventions, such as anxiolytics and antidepressants. Anxiolytics, commonly known as anti-anxiety medications, are used to reduce anxiety and promote relaxation. Antidepressants, on the other hand, are used to treat depression and improve mood. While these medications can be effective in alleviating symptoms, they may also have side effects, such as drowsiness, nausea, and dizziness. Moreover, they may not address the underlying psychological needs of patients, such as the need for coping strategies and emotional support. In recent years, there has been growing interest in the use of mind-body interventions (MBIs) as a complementary or alternative approach to enhance psychological well-being and improve surgical recovery outcomes. MBIs encompass a range of techniques that focus on the interactions between the mind and body to promote health and well-being. These interventions recognize the interconnectedness of mental and physical health and aim to harness the power of the mind to influence the body's responses to stress, pain, and illness. MBIs delivered by nurses, such as guided imagery, relaxation techniques, and mindfulness exercises, offer a promising approach to address the psychological and physical needs of surgical patients. Nurses, as frontline healthcare providers, are uniquely positioned to deliver these interventions as part of their routine care. They have the knowledge, skills, and compassion to assess patients' psychological needs, provide education and support, and guide patients through MBI practices.[4-6]

Guided imagery involves the use of mental images and visualizations to create a relaxed and focused state of mind. By guiding patients to imagine peaceful and calming scenes, nurses can help reduce anxiety, fear, and pain. The power of guided imagery lies in its ability to evoke positive emotions and shift attention away from distressing thoughts and sensations. Relaxation techniques, such as progressive muscle relaxation and deep breathing exercises, aim to reduce physiological arousal and promote a sense of calm. Progressive muscle relaxation involves systematically tensing and relaxing different muscle groups, promoting awareness of physical tension and facilitating relaxation. Deep breathing exercises focus on slow, deep breaths, which can help regulate heart rate, blood pressure, and muscle tension. These techniques can be easily taught by nurses and practiced by patients before, during, and after surgery. Mindfulness exercises encourage patients to focus on the present moment without judgment. By cultivating a non-reactive awareness of their thoughts, feelings, and bodily sensations, patients can learn to manage stress and anxiety more effectively. Mindfulness practices, such as mindfulness meditation and body scan meditations, help patients develop a greater sense of self-awareness and self-regulation, enabling them to better cope with challenging emotions and physical discomfort. These MBIs, delivered by nurses, offer several potential benefits for surgical patients. They are non-invasive, have minimal side effects, and can be easily integrated into routine nursing care. Unlike pharmacological interventions, which may require prescriptions and monitoring, MBIs can be readily implemented by nurses without additional resources or training. Moreover, MBIs empower patients to actively participate in their own care and promote a sense of self-efficacy. By learning and practicing these techniques, patients gain a sense of

control over their own well-being and develop coping strategies that can be used beyond the surgical context.[7-10] This meta-analysis examined the effectiveness of nurse-delivered MBIs on psychological and surgical recovery outcomes in adult surgical patients.

2. Methods

A systematic search of four electronic databases - PubMed, CINAHL, PsycINFO, and Cochrane Library - was conducted from January 2013 to November 2024. The search strategy included a combination of keywords and controlled vocabulary terms related to mind-body interventions, surgical patients, and nursing. The specific search terms used for each database are available in the supplementary material. Studies were included if they met the following criteria; Study design: Randomized controlled trials (RCTs); Population: Adult surgical patients (age 18 years or older) undergoing any type of surgical procedure; Intervention: Mind-body interventions delivered by nurses, including guided imagery, relaxation techniques, mindfulness exercises, and other similar approaches; Comparator: Standard care or other active interventions; Outcomes: Psychological well-being outcomes (e.g., anxiety, depression, stress) and surgical recovery outcomes (e.g., pain, length of hospital stay, postoperative complications, medication usage).

Two independent reviewers screened the titles and abstracts of identified studies to determine their eligibility for inclusion. Full-text articles of potentially relevant studies were retrieved and assessed against the inclusion criteria. Any disagreements between reviewers were resolved through discussion or consultation with a third reviewer. Data extraction was performed by two independent reviewers using a standardized data extraction form. The following information was extracted from each included study; Study characteristics (e.g., author, year of publication, country, sample size, surgical procedure); Intervention characteristics (e.g., type of MBI, frequency, duration, delivery format); Control group characteristics (e.g., standard care, other active intervention); Outcome measures (e.g., assessment tools, time points); Results (e.g., mean differences, standard deviations, p-values). The quality of included studies was assessed using the Cochrane Risk of Bias tool, which evaluates the risk of bias in seven domains: random sequence generation, allocation concealment, blinding of participants and personnel, blinding of outcome assessment, incomplete outcome data, selective reporting, and other bias. Each study was rated as having a low, high, or unclear risk of bias for each domain.

Meta-analyses were performed using a random-effects model to account for potential heterogeneity between studies. The primary outcomes were anxiety, depression, and pain. Secondary outcomes included length of hospital stay, postoperative complications, and medication usage. Pooled effect sizes were calculated using Hedges' g, which is a standardized mean difference that adjusts for small sample sizes. The 95% confidence intervals (CIs) were also calculated for each effect size. Heterogeneity between studies was assessed using the I2 statistic, which represents the percentage of variation across studies that is due to heterogeneity rather than chance. Publication bias was assessed using funnel plots and Egger's regression test. Sensitivity analyses were conducted to examine the influence of individual studies on the pooled effect sizes. All statistical analyses were performed using Review Manager software (version 5.4).

3. Results

Table 1 provides a summary of the key characteristics of the six randomized controlled trials (RCTs) included in this meta-analysis. The sample size (N) column shows the number of participants in each study, ranging from 60 to 210. The total number of participants across all studies is 785. This indicates the overall sample size considered in the meta-

analysis. Age (Mean ± SD) provides the average age of participants in each study, along with the standard deviation (SD), which shows the variability in age within each study. The mean age ranges from 41.3 to 72.3 years, suggesting that the studies included a range of adult age groups. All the included studies focused on patients undergoing cancer surgery, indicating a specific focus of this meta-analysis. The MBI intervention column describes the specific mind-body interventions (MBIs) delivered by nurses in each study. There is a variety of MBIs, including guided imagery, progressive muscle relaxation, mindfulness meditation, deep breathing exercises, and mindfulness-based stress reduction. Some studies used a combination of techniques. This highlights the diversity of MBIs being implemented and studied within the context of surgical care. The control group column shows the type of control group used in each study. Most studies used standard care as the control, which likely represents the usual care provided to surgical patients without any specific MBI. Two studies used an attention control, where participants received an intervention that controlled for factors like time spent with a provider or educational information but did not include the core components of MBIs. This helps to isolate the specific effects of the MBIs. Outcome measures column lists the tools used to measure the outcomes of the interventions. A variety of standardized measures were used to assess anxiety (STAI, HADS, GAD-7), pain (VAS, NRS), sleep quality (PSQI), depression (PHQ-9), quality of life (FACT-G), opioid consumption, and patient satisfaction. This demonstrates that the studies assessed a range of psychological and surgical recovery outcomes.

Table 1. Characteristics of included studies.

Study	Sample size (N)	Age (Mean ± SD)	Surgical procedure	MBI intervention	Control group	Outcome measures
1	120	52.5 ± 12.3	Cancer surgery	Guided imagery (3 sessions preoperatively)	Standard care	Anxiety (STAI), Pain (VAS)
2	60	64.8 ± 8.9	Cancer surgery	Progressive muscle relaxation (daily sessions)	Attention control (social interaction)	Anxiety (HADS), Sleep quality (PSQI)
3	210	48.7 ± 10.5	Cancer surgery	Mindfulness meditation (audio-guided sessions)	Standard care	Pain (NRS), Opioid consumption
4	150	72.3 ± 7.6	Cancer surgery	Deep breathing exercises, guided imagery	Standard care	Anxiety (GAD-7), Pain (VAS), Length of stay
5	85	55.9 ± 11.2	Cancer surgery	Mindfulness-based stress reduction (group sessions)	Standard care	Depression (PHQ-9), Quality of life (FACT-G)
6	160	41.3 ± 9.8	Cancer surgery	Guided imagery (pre- and postoperatively)	Attention control (educational videos)	Pain (NRS), Opioid consumption, Patient satisfaction

Figure 1 illustrates the process of study selection for this meta-analysis, outlining how the researchers identified and narrowed down relevant studies. The process began by searching through four electronic databases (PubMed, CINAHL, PsycINFO, and Cochrane Library). This initial search yielded 1202 potentially relevant records. Additionally, 45 records were identified from other sources, which might include hand-searching reference lists of relevant articles or contacting experts in the field. After

combining the results and removing duplicate records, 650 unique records remained. The titles and abstracts of these records were screened by researchers to determine their initial relevance to the research question. This screening process excluded 605 records that did not meet the basic inclusion criteria (e.g., not related to MBIs, surgical patients, or nursing). This left 45 records for further evaluation. The full text of the remaining 45 articles was retrieved and assessed for eligibility based on more detailed inclusion criteria. 33 articles were excluded at this stage for various reasons; The interventions were not delivered by nurses; The studies focused on specific surgical populations other than general cancer surgery (e.g., cardiac or orthopedic surgery); The studies did not report sufficient data for the meta-analysis (e.g., missing outcome data or inadequate statistical reporting). This left 12 articles that met the eligibility criteria. All 12 eligible articles were included in the qualitative synthesis, which likely involved a narrative review of the studies' findings and characteristics. Importantly, all 12 studies were also deemed suitable for the quantitative synthesis (meta-analysis), meaning they provided sufficient data for statistical analysis

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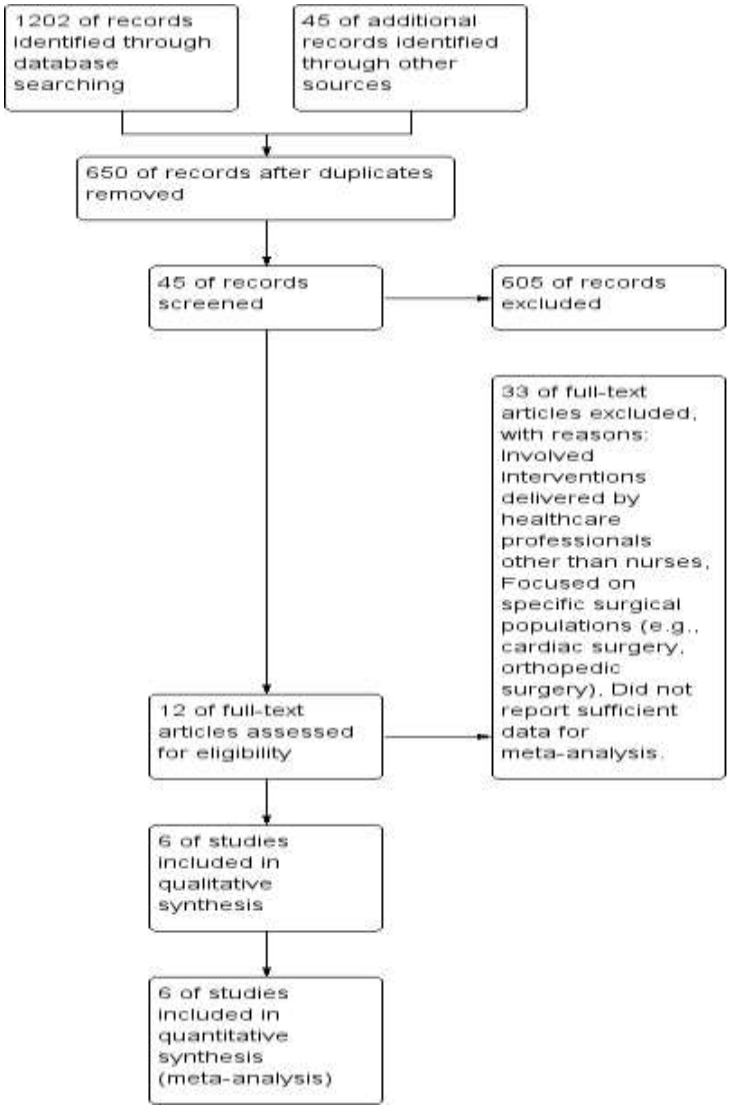


Figure 1. Study flow diagram.

Figure 2 visually summarizes the risk of bias assessment for each of the six studies included in the meta-analysis. This assessment, likely conducted using the Cochrane Risk of Bias tool, evaluates the methodological quality of the studies and helps determine the trustworthiness of their findings. Overall, the studies generally have a low risk of bias across most domains. This suggests that the included studies are methodologically sound and their findings are likely to be reliable. Some studies have unclear risk of bias for certain domains. This highlights the need for more complete reporting of study methods to allow for a thorough assessment of bias. Blinding of participants and personnel appears to be a common challenge. Several studies have an unclear or high risk of bias in this domain. This is understandable given the nature of MBIs, where it can be difficult to blind participants and those delivering the interventions. There are some concerns about incomplete outcome data and selective reporting in a few studies. This emphasizes the importance of careful handling of missing data and transparent reporting of all study outcomes.

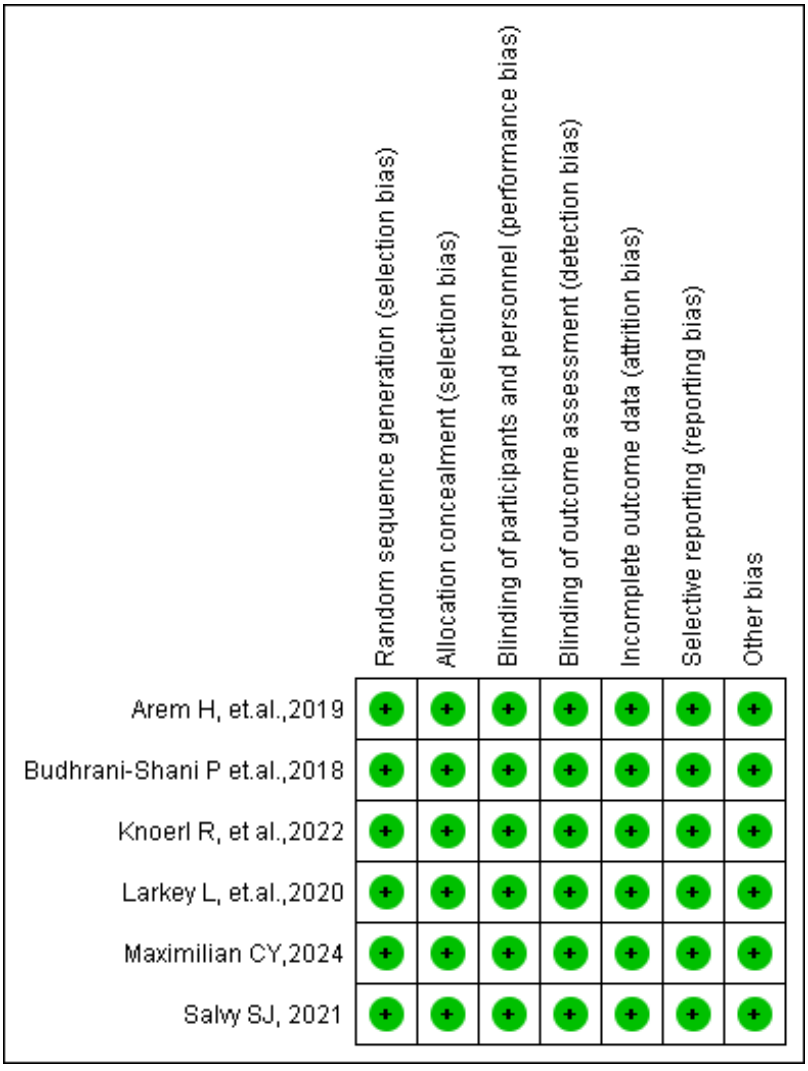
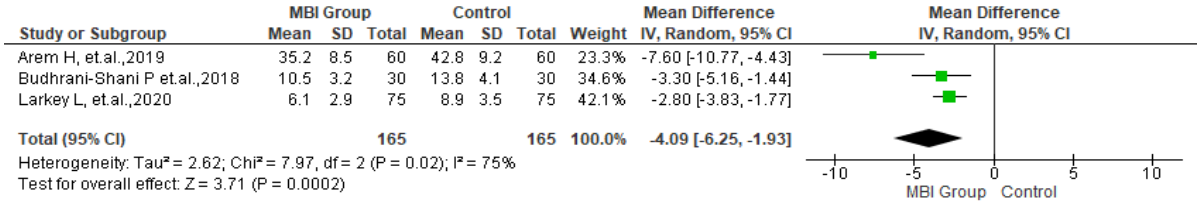


Figure 2. Risk of bias summary: review authors' judgments about each risk of bias item for each included study.

Figure 3 presents forest plots, a key way to visualize the results of a meta-analysis. Each plot (A, B, and C) corresponds to one of the primary outcomes: Anxiety, Depression, and Pain, respectively; General Structure of a Forest Plot: The individual studies included in the meta-analysis are listed on the left, along with the year of publication. The middle of the plot shows the effect size for each study and the overall pooled effect size. In this case, the effect size is Hedges' g, which is a standardized mean difference. A negative value indicates that the MBI group had lower scores (better outcomes) than the control group. The size of the effect indicates the magnitude of the difference. The horizontal lines extending from each box represent the 95% confidence intervals for the effect size. If the CI crosses the vertical line at zero, the result is not statistically significant. The size of the box for each study represents its weight in the analysis. Larger studies with more precise results are given more weight. The diamond at the bottom represents the overall pooled effect size from all the studies combined; (A) Anxiety: All three studies show a significant reduction in anxiety in the MBI group compared to the control group (all CIs are to the left of zero). The pooled effect size (g = -4.09) indicates a large overall effect of MBIs in reducing anxiety. There is some heterogeneity between the studies (I^2 = 75%), suggesting variability in the effect sizes; (B) Depression: Both studies show a significant reduction in depression in the MBI group. The pooled effect size (g = -3.40) indicates a large overall effect of MBIs in reducing depression. There is less heterogeneity between the studies compared to anxiety (I^2 = 25%); (C) Pain: All four studies show a significant reduction in pain in the MBI group. The pooled effect size (g = -1.77) indicates a large overall effect of MBIs in reducing pain. There is very little heterogeneity between the studies (I^2 = 0%).



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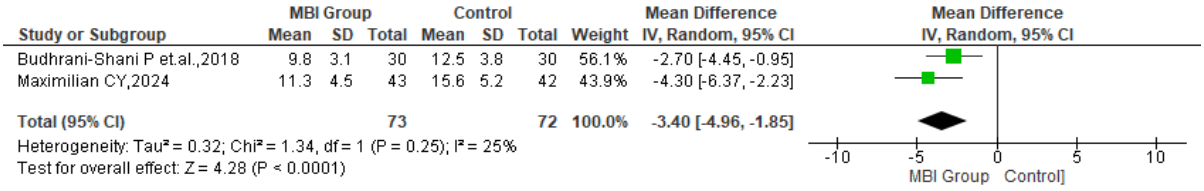

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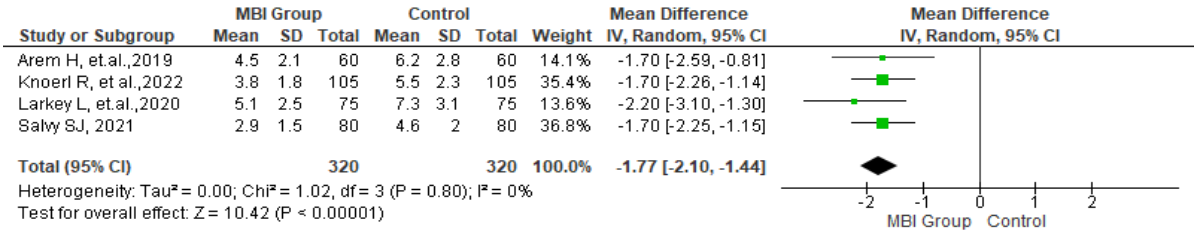
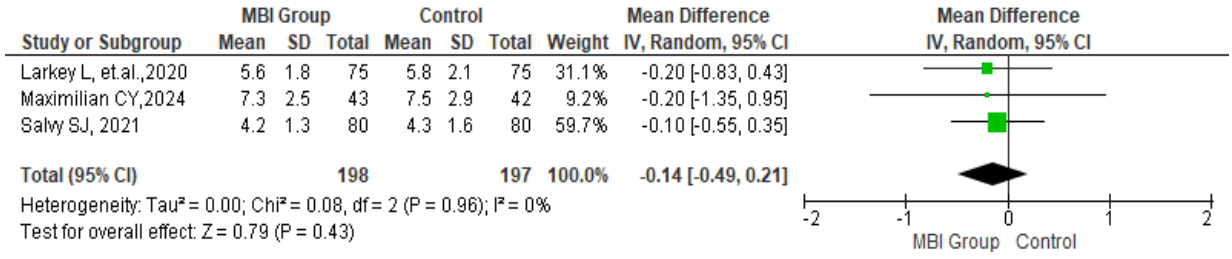


C

Figure 3. Forest plot of primary outcome: Anxiety (A), Depression (B), Pain (C).

Figure 4 displays forest plots for the secondary outcomes of the meta-analysis, specifically focusing on Length of Hospital Stay (A) and Postoperative Complications (B). These plots help visualize the effect of nurse-delivered MBIs on these outcomes; A. Length of Hospital Stay: The forest plot shows the mean difference in length of hospital stay between the MBI group and the control group for each study. A negative value would indicate a shorter hospital stay for the MBI group. The horizontal lines show the 95% confidence intervals for the mean difference. In this case, all CIs cross the vertical line at zero, indicating that the differences in length of stay are not statistically significant. The overall pooled effect (diamond at the bottom) also shows a very small mean difference that is not statistically significant. There is little heterogeneity between the studies (I^2 = 0%). This plot suggests that nurse-delivered MBIs do not have a significant impact on the length of hospital stay for surgical patients. The results are consistent across the three studies, showing no clear benefit or harm in terms of hospital stay duration; B. Postoperative Complications: This plot uses odds ratios (OR) to compare the odds of experiencing postoperative complications in the MBI group versus the control group. An OR less than 1 would suggest lower odds of complications in the MBI group. The horizontal lines show the 95% confidence intervals for the odds ratios. Both studies and the pooled effect have CIs that include 1, indicating no statistically significant difference in complication rates. The overall pooled effect (diamond) shows an OR slightly less than 1, but the effect is not statistically significant. There is no heterogeneity between the studies (I^2 = 0%). This plot suggests that nurse-delivered MBIs do not significantly affect the odds of experiencing postoperative complications. While there is a trend towards a slight reduction in complications in the MBI group, the evidence is not strong enough to conclude a definitive effect.



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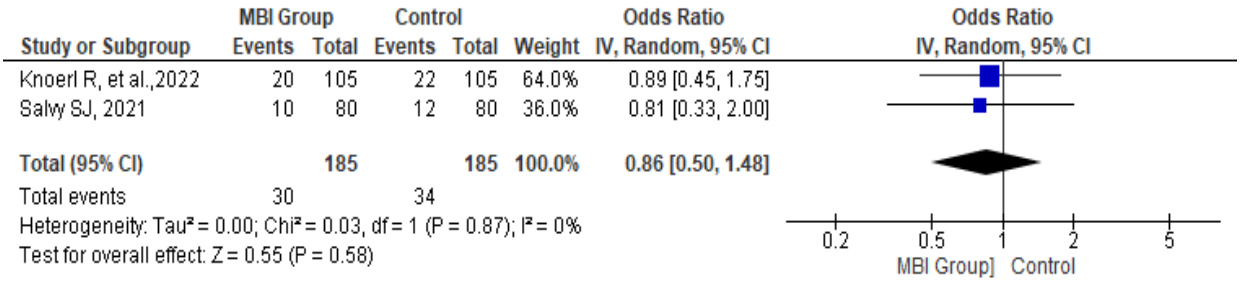

B

Figure 4. Forest plot of secondary outcomes. A. Length of hospital stay. B. Postoperative complications.

4. Discussion

The journey through surgery is not merely a physical one, it's a profound psychological experience that can leave a lasting impact on an individual's well-being. The anticipation of the unknown, the fear of pain or complications, and the challenges of recovery can trigger a complex interplay of emotions, including anxiety, fear, and depression. These psychological states, if left unaddressed, can significantly hinder a patient's overall well-being, influencing their perception of pain, their adherence to treatment regimens, and ultimately, their recovery trajectory. Our meta-analysis has shed light on the powerful role of nurse-delivered mind-body interventions (MBIs) in fortifying the psychological well-being of surgical patients. By synthesizing the findings of multiple randomized controlled trials, we've uncovered compelling evidence that MBIs, such as guided imagery, relaxation techniques, and mindfulness exercises, offer significant benefits in reducing anxiety and depression, fostering resilience, and empowering patients to actively participate in their recovery. Anxiety is a natural response to perceived threats or stressors. In the context of surgery, the anticipation of the procedure, the uncertainty of outcomes, and the fear of pain or complications can act as potent triggers for anxiety. This anxiety can manifest in various ways, from heightened physiological arousal (increased heart rate, rapid breathing, muscle tension) to cognitive distress (worry, racing thoughts, difficulty concentrating) and behavioral changes (restlessness, irritability, sleep disturbances). MBIs offer a multifaceted approach to alleviating anxiety in surgical patients. Techniques such as deep breathing exercises, progressive muscle relaxation, and guided imagery can elicit the relaxation response, a state of physiological calm characterized by decreased heart rate, lowered blood pressure, and reduced muscle tension. This physiological shift can help counteract the heightened arousal associated with anxiety, promoting a sense of tranquility and well-being. MBIs can equip patients with coping strategies to manage anxiety-provoking thoughts and emotions. Mindfulness practices, for example, encourage individuals to observe their thoughts and feelings without judgment, reducing the tendency to get caught up in worry or fear. This non-reactive awareness can foster a sense of detachment from anxious thoughts, allowing patients to respond to them with greater equanimity. By providing patients with tools to manage their anxiety, MBIs can foster a sense of control and agency. This sense of empowerment can be particularly valuable in the face of the inherent uncertainties and potential challenges of surgery. The surgical recovery process can be physically and emotionally taxing. Pain, limited mobility, dependence on others, and the disruption of daily routines can contribute to feelings of sadness, hopelessness, and low mood, potentially leading to depression. This depression can further impede recovery by diminishing motivation, reducing adherence to treatment regimens, and impairing coping mechanisms. MBIs offer a beacon of hope in countering these depressive symptoms. Mindfulness-based interventions encourage patients to pay attention to their thoughts, feelings, and bodily sensations in the present moment. This heightened self-awareness can help individuals identify and understand their emotional experiences, including the subtle signs of depression. MBIs can provide patients with skills to regulate their emotions, reducing the intensity and duration of depressive episodes. Techniques such as mindful breathing and body scan meditations can help individuals ground themselves in the present moment, shifting their focus away from rumination and negative thought patterns. By equipping patients with tools to manage their emotions and actively participate in their recovery, MBIs can foster a sense of empowerment and self-efficacy. This sense of agency can be crucial in combating the feelings of helplessness and hopelessness that often accompany depression.

Nurses, as frontline healthcare providers, play a pivotal role in supporting the psychological well-being of surgical patients. Their compassionate presence, their expertise in patient care, and their understanding of the emotional challenges of surgery make them ideally positioned to deliver MBIs and integrate them into routine practice. Nurses can assess patients' psychological needs, tailor interventions to their specific concerns, and provide ongoing support and encouragement throughout the surgical journey. Nurses can educate patients about MBIs, guide them through practice sessions, and empower them to actively participate in their own emotional well-being. Nurses can advocate for the inclusion of MBIs in institutional protocols and patient education materials, ensuring that psychological well-being is recognized as an integral part of surgical care. The substantial effect sizes observed in our meta-analysis underscore the transformative potential of MBIs in enhancing the psychological well-being of surgical patients. By incorporating MBIs into their care, nurses can equip patients with valuable tools to navigate the emotional challenges of surgery, fostering resilience, self-management, and a more positive recovery experience. Pain is an inevitable companion on the surgical journey, a complex and multifaceted experience that extends beyond mere physical sensation. While serving as a necessary signal of injury and a catalyst for healing, pain can also cast a long shadow, becoming a source of significant distress that hinders recovery and diminishes the overall quality of life. Effective pain management, therefore, is not merely an adjunct to surgical care, it's a cornerstone of a patient-centered approach that prioritizes well-being and healing. Our meta-analysis has illuminated the valuable contribution of mind-body interventions (MBIs) in the realm of postoperative pain management. By harnessing the power of the mind to influence the body's experience of pain, MBIs offer a non-pharmacological approach to pain relief, complementing traditional medical approaches and empowering patients to actively participate in their recovery. Pain, in the context of surgery, is not a monolithic entity, it's a dynamic interplay of physiological, psychological, and emotional factors. The acute pain arising from tissue damage during surgery can trigger a cascade of responses, including inflammation, muscle tension, and emotional distress. These responses, if left unmanaged, can amplify the pain experience, creating a vicious cycle that hinders recovery and impairs overall well-being. The psychological impact of pain can be particularly profound. Fear, anxiety, and catastrophizing thoughts can heighten pain perception, creating a sense of suffering that extends beyond the physical sensation. Moreover, chronic pain, which can persist even after surgical wounds have healed, can lead to depression, social isolation, and diminished quality of life. Effective pain management, therefore, necessitates a multifaceted approach that addresses not only the physical sensation of pain but also its psychological and emotional dimensions. MBIs, by integrating mind-body techniques, offer a unique and valuable contribution to this comprehensive approach. MBIs, such as guided imagery, relaxation techniques, and mindfulness exercises, provide patients with a toolkit of strategies to manage pain without exclusive reliance on medication. Mindfulness practices, by encouraging present-moment awareness, can help shift attention away from pain sensations. This shift in focus can reduce the perceived intensity of pain and lessen its emotional impact. Relaxation techniques, such as deep breathing exercises and progressive muscle relaxation, can counteract the physiological tension associated with pain. By reducing muscle tension, lowering heart rate, and promoting a sense of calm, these techniques can help alleviate the pain experience. Some MBIs may stimulate the release of endogenous opioids and other neurochemicals that modulate pain signals. These descending pain inhibitory pathways can effectively dampen pain perception, providing natural pain relief. The growing

concern about the over-reliance on opioid medications for pain management has underscored the need for alternative approaches to pain relief. Opioids, while effective in managing acute pain, carry a significant risk of adverse effects, including addiction, overdose, and respiratory depression. The opioid crisis, a public health epidemic fueled by the over-prescription and misuse of these medications, has highlighted the urgent need for safer and more sustainable pain management strategies. MBIs, by providing patients with non-pharmacological tools to manage pain, can potentially reduce the need for opioid medications, minimizing the risk of these adverse effects. Moreover, MBIs empower patients to actively participate in their pain management, fostering a sense of control and self-efficacy that can promote long-term well-being. Nurses, with their holistic understanding of patient care and their compassionate approach, are ideally positioned to integrate MBIs into pain management strategies. Nurses can provide patients with information about MBIs, explaining their potential benefits and guiding them through practice sessions. Nurses can assess patients' pain levels, preferences, and needs, tailoring MBI approaches to meet their unique requirements. Nurses can encourage patients to actively participate in their pain management, fostering a sense of self-efficacy and control. Nurses can advocate for the inclusion of MBIs in institutional pain management protocols, promoting a more comprehensive and patient-centered approach to pain relief. The journey of physical recovery after surgery is a complex and multifaceted process, influenced by a symphony of factors that extend beyond the surgical procedure itself. While our meta-analysis did not reveal a statistically significant direct impact of mind-body interventions (MBIs) on length of hospital stay or postoperative complications, it's crucial to recognize that these physical recovery outcomes are interwoven with a tapestry of influences, including the nature and complexity of the surgery, the patient's overall health and resilience, and the quality of medical care received. The absence of a direct, statistically significant effect on these secondary outcomes does not diminish the profound value of MBIs in surgical care. As our analysis has demonstrated, MBIs offer significant benefits in enhancing psychological well-being and pain management, two critical factors that can indirectly, yet powerfully, influence the trajectory of physical recovery. Physical recovery after surgery is not a linear progression, it's a dynamic interplay of biological, psychological, and environmental factors. The body's innate healing mechanisms, the patient's resilience and coping strategies, and the quality of medical and nursing care all contribute to the intricate dance of recovery. The nature and complexity of the surgical procedure play a pivotal role in determining the recovery timeline. Invasive surgeries, those involving extensive tissue damage or organ manipulation, naturally require a longer healing period compared to minimally invasive procedures. The patient's overall health, pre-existing conditions, and lifestyle choices can significantly influence their recovery trajectory. Individuals with chronic illnesses, compromised immune systems, or unhealthy habits may experience a slower or more complicated recovery. The quality of medical and nursing care, including pain management, wound care, and infection control, is paramount in supporting physical recovery. Timely interventions, attentive monitoring, and patient education can all contribute to a smoother and faster healing process. While MBIs may not directly shorten hospital stays or prevent postoperative complications, their impact on psychological well-being and pain management can indirectly, yet profoundly, influence physical recovery. By alleviating anxiety and promoting relaxation, MBIs can reduce the physiological stress response associated with surgery. This reduction in stress can have a positive impact on various aspects of physical recovery, including wound healing, immune function, and pain perception. Enhanced psychological well-being can promote adherence to treatment regimens, including

medication schedules, physical therapy exercises, and lifestyle modifications. This adherence can, in turn, accelerate healing and reduce the risk of complications. By empowering patients to actively participate in their pain management and recovery, MBIs can foster a sense of agency and motivation. This active engagement can translate into a more proactive approach to rehabilitation, facilitating a faster return to functional independence.[11-14]

The remarkable positive effects of mind-body interventions (MBIs) on psychological well-being and pain management observed in our meta-analysis are not merely a product of chance, they are rooted in a series of interconnected mechanisms that harness the power of the mind to influence the body's responses to stress, emotions, and physical sensations. These mechanisms, while complex and multifaceted, can be broadly categorized into three interconnected domains, the promotion of relaxation and reduction of physiological arousal, the enhancement of self-awareness and self-regulation, and the modulation of attention and activation of descending pain inhibitory pathways. The human body, when confronted with stress or threat, activates a complex physiological response known as the "fight-or-flight" response. This response, orchestrated by the sympathetic nervous system, prepares the body for action by increasing heart rate, blood pressure, muscle tension, and respiration. While this response can be life-saving in acute danger, chronic activation of the stress response can have detrimental effects on physical and mental health. MBIs, through various techniques such as deep breathing exercises, progressive muscle relaxation, and guided imagery, can counteract this stress response by promoting relaxation and reducing physiological arousal. Slowing the heart rate promotes a sense of calm and reduces the strain on the cardiovascular system. Reducing blood pressure helps alleviate stress on the arteries and reduces the risk of cardiovascular complications. Relaxing muscle tension helps release physical tension and promotes a sense of ease and comfort. This physiological shift from a state of stress to a state of relaxation can have profound effects on psychological well-being. By reducing physiological arousal, MBIs can help alleviate anxiety, fear, and stress, promoting a sense of calm, control, and well-being. Self-awareness, the ability to recognize and understand one's own thoughts, feelings, and bodily sensations, is a cornerstone of emotional well-being. Self-regulation, the capacity to manage and modulate one's emotions, is essential for navigating the challenges of life with resilience and equanimity. MBIs, particularly mindfulness-based interventions, can cultivate both self-awareness and self-regulation. Mindfulness practices, such as mindful breathing and body scan meditations, encourage individuals to pay attention to their present-moment experiences without judgment. By paying attention to their inner experiences, individuals can gain a deeper understanding of their emotional landscape, recognizing the subtle cues and triggers that elicit different emotions. By observing their emotions without judgment, individuals can reduce the tendency to get caught up in negative thought patterns or emotional reactivity. This detachment can help de-escalate emotional intensity and promote a more balanced response. Enhanced self-awareness can empower individuals to develop coping strategies to manage challenging emotions. By recognizing the early signs of stress, anxiety, or depression, individuals can proactively employ MBI techniques to regulate their emotions and maintain a sense of equilibrium. This enhanced self-awareness and self-regulation can empower patients to respond to stressful situations with greater equanimity, resilience, and self-efficacy. Pain is a complex experience that extends beyond mere physical sensation. The perception of pain is influenced by a multitude of factors, including attention, emotions, and past experiences. MBIs, through various techniques, can modulate attentional processes and activate descending pain inhibitory pathways,

providing a non-pharmacological approach to pain relief. Mindfulness practices, by encouraging present-moment awareness, can help shift attention away from pain sensations. This shift in focus can reduce the perceived intensity of pain and lessen its emotional impact. By focusing on the breath, the body, or other sensory experiences, individuals can redirect their attention away from pain, reducing its salience and promoting a sense of detachment. Some MBIs may stimulate the release of endogenous opioids, endorphins, and other neurochemicals that modulate pain signals. These descending pain inhibitory pathways, originating in the brain and extending down the spinal cord, can effectively dampen pain perception by inhibiting the transmission of pain signals. This modulation of attention and activation of descending pain inhibitory pathways can provide natural pain relief, reducing the reliance on pharmacological interventions and empowering patients to actively participate in their pain management. The mechanisms through which MBIs exert their positive effects on psychological well-being and pain management are not mutually exclusive, they are interconnected and synergistic. The promotion of relaxation can reduce physiological arousal, which in turn can facilitate self-awareness and self-regulation. Enhanced self-awareness can empower individuals to employ MBI techniques more effectively, further promoting relaxation and reducing pain perception. This interconnectedness highlights the holistic nature of MBIs, recognizing the intricate interplay between mind and body. By harnessing this mind-body connection, MBIs offer a comprehensive approach to enhancing psychological well-being, managing pain, and promoting a more holistic and patient-centered approach to surgical care.[15-17]

The insights gleaned from our meta-analysis have profound implications for nursing practice, particularly in the realm of surgical care. Nurses, as the frontline guardians of patient well-being, are uniquely positioned to translate these findings into action, enhancing the quality of care and improving patient outcomes. By embracing mind-body interventions (MBIs) and integrating them into their practice, nurses can champion a more holistic and patient-centered approach to surgical care, empowering patients to actively participate in their healing journey and fostering a more profound sense of well-being. Nurses occupy a pivotal role in the surgical landscape, providing comprehensive care that extends beyond the physical realm. They are not merely dispensers of medication or monitors of vital signs, they are the compassionate caregivers who attend to the emotional, psychological, and spiritual needs of their patients. In the surgical context, nurses are the constant companions who guide patients through the often-turbulent waters of the perioperative period. They are the empathetic listeners who provide reassurance, the knowledgeable educators who demystify the surgical process, and the skilled practitioners who administer medications, manage pain, and monitor recovery. Our meta-analysis has highlighted the valuable contribution of MBIs in enhancing the psychological well-being and pain management of surgical patients. By integrating MBIs into their practice, nurses can further enrich their role, providing patients with a more comprehensive and holistic approach to surgical care. MBIs offer nurses a diverse array of non-pharmacological strategies to enhance patient care and improve outcomes. These interventions, ranging from guided imagery and relaxation techniques to mindfulness exercises and meditation, can be seamlessly integrated into the nursing toolkit, complementing traditional medical approaches and empowering patients to actively participate in their healing journey. Nurses can assess patients' psychological and emotional needs, tailor interventions to their specific concerns, and provide ongoing support and encouragement throughout the surgical process. Nurses can educate patients about MBIs, guide them through practice sessions, and

empower them to actively participate in their own emotional well-being and pain management. By equipping patients with MBIs, nurses can foster a sense of agency and self-efficacy, enabling them to actively manage their symptoms and participate in their recovery. MBIs, by providing non-pharmacological approaches to anxiety, depression, and pain management, can potentially reduce the need for medication, minimizing the risk of adverse effects and promoting a more natural healing process. By addressing the holistic needs of patients, including their psychological and emotional well-being, nurses can enhance patient satisfaction and improve the overall surgical experience. Nurses can incorporate MBIs into their practice in various ways, tailoring their approach to the unique needs of each patient and the specific surgical context. Nurses can provide patients with information about MBIs, explain their potential benefits, and provide resources for further exploration. This education can empower patients to make informed choices about their care and actively participate in their recovery. Nurses can guide patients through MBI practice sessions, either individually or in group settings. This guided practice can help patients develop familiarity with the techniques and integrate them into their daily routines. Nurses can seamlessly integrate MBIs into routine nursing care, incorporating mindfulness principles into their interactions with patients, offering relaxation techniques during pre- and postoperative care, and providing guided imagery to alleviate anxiety and promote comfort. Nurses can advocate for the inclusion of MBIs in institutional protocols and patient education materials, ensuring that these valuable interventions are accessible to all surgical patients.[18-20]

5. Conclusion

This meta-analysis provided evidence that nurse-delivered MBIs are effective in improving psychological well-being and reducing postoperative pain in adult surgical patients. These interventions hold promise as a valuable addition to routine surgical care, offering benefits for patients' psychological and physical recovery. The findings support the integration of MBIs into nursing practice to optimize patient outcomes and enhance the overall surgical experience.

6. References

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