



Review

Meditation for the reduction of perioperative anxiety in patients undergoing oncology surgery: A scoping review



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ABSTRACT

Objective: Patients undergoing surgery, particularly patients undergoing surgery for oncology diagnoses, experience anxiety. Surgery remains the primary treatment for many common types of cancer. One promising potential intervention to alleviate anxiety in the preoperative and postoperative period is meditation, an integrative medicine intervention. However, there remains a gap in the literature regarding the effectiveness of meditation to alleviate anxiety during the perioperative time period.

Methods: The scoping review was conducted using the Arksey and O'Malley framework to synthesize the study findings and was reported with the Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR). The review included EMBASE, PubMed, Web of Science, CINAHL Plus, Scopus, and Cochrane Review databases from 2013 through 2024. All identified articles were exported to the online systematic review software, Covidence.

Results: A total of 538 initial citations were identified, 415 titles and abstracts were screened, and 83 full-text articles reviewed. Six studies were finally included. The data extracted from the literature included: study purpose, study design, sample size, preoperative or postoperative timeframe, instrument to evaluate anxiety, and conclusions.

Conclusions: For patients undergoing oncology surgery, the perioperative period can be filled with anxiety. Guided, mindfulness, and loving-kindness meditation may be helpful in reducing anxiety, particularly in patients undergoing surgery for breast cancer during the postoperative period. However, the current literature is extremely limited. Future research should expand on the preliminary effectiveness to broader populations and carefully target the highest-risk populations for the ideal time point for interventions.

Introduction

Patients undergoing surgery, particularly patients undergoing surgery for oncology diagnoses, experience anxiety. Surgery remains the primary treatment for many common types of cancer. The perioperative phase can compound the anxiety related to a patient's diagnosis, treatment, and awaiting additional pathology results.^{1,2}

When a person experiences a stressful event, such as anxiety, it may lead to the activation of the stress response consisting of the sympathetic

nervous system (SNS) and the hypothalamic-pituitary-adrenal (HPA) axis. The activation of these pathways leads to the release of neurotransmitters and hormones that facilitate behavioral and biochemical changes. The SNS activation, also known as the "fight or flight" response, prepares the body for physical activity by directing oxygen-rich blood to the areas of the body needed during intense physical demand.³ In addition to an increase in heart rate and blood pressure, the SNS activation impacts many organ systems throughout the body. In patients with cancer, the current research suggests that the dysregulation of the SNS

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and HPA axis may lead to cancer progression through tumor cell progression and immune system dysfunction.⁴

Complementary therapies, that improve quality of life and decrease anxiety and the resulting stress response, may also prevent cancer progression. One promising intervention to alleviate anxiety in the perioperative period is the complementary medicine tool, meditation including mindfulness, loving-kind, and guided imagery.⁵ Meditation is an integrative medicine intervention that helps focus attention to achieve a mental state of calm concentration and positive emotions.⁶ There has been a dramatic increase in randomized controlled trials of meditation interventions over the past twenty years.⁶ Meditation interventions have been demonstrated to be effective in decreasing pain severity, anxiety, stress, and depression in patients with cancer.⁷⁻¹⁰

Meditation has been demonstrated to reduce anxiety in the perioperative period in other populations. For example, patients undergoing intra- or peri-articular injections who listened to a meditation monologue via phone or mobile application reported a significant decrease in anxiety ($P = 0.04$) and diastolic blood pressure measurements revealed a significant decrease in the preoperative time period.¹¹ However, the efficacy of meditation to decrease anxiety in oncology patients during the perioperative phase is unclear. Therefore, a scoping review framework was selected to identify the gaps in the literature and provide guidance for future research.¹²

The purpose of this scoping review of the literature is to describe the types, time points, delivery methods of meditation, and effectiveness of reducing anxiety in the perioperative setting.

Methods

The scoping review was conducted using the Arksey and O'Malley¹² framework to synthesize the study findings was reported utilizing the Preferred Reporting Items for Systematic reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR).¹³ The Arksey and O'Malley framework includes identifying the research question, relevant studies, selecting the studies, charting the data, and summarizing the data and reporting results.

The research questions identified for this process included:

What type of meditation was used?

When and how was the meditation administered to participants?

What effect did the meditation have on anxiety?

Search strategy

The review included EMBASE, PubMed, CINAHL Plus, Scopus, Web of Science, and Cochrane Review databases from 2013 through 2024 using combinations of the keywords: perioperative, anxiety, mindfulness, meditation, and oncology. The bibliography and citations of the included studies were searched to identify any additional studies.

The studies were screened for the inclusion criteria of: (1) adult patients; (2) utilized a meditation intervention; and (3) in the perioperative or procedural time period. Studies that did not include the outcome of anxiety were excluded. One author screened the titles and abstracts. Then two authors independently assessed the full-text articles and discussed all discrepancies. Consensus was reached in all cases.

Data extraction and synthesis

All identified articles were exported to the online systematic review software, Covidence, a web-based collaboration software platform that streamlines the production of systematic and other literature reviews. The data extraction framework was developed based on the scoping review questions and the PRISMA-ScR guidelines. The data extracted from the literature included: study purpose, study design, population characteristics, sample size, time point, type of surgery, instrument to evaluate anxiety, and conclusions. The data extraction was confirmed and synthesized by two authors.

Results

Study characteristics

A total of 538 initial citations were identified, 415 titles and abstracts were screened, and 83 full-text articles (Fig. 1). Six studies were included in this review (Table 1).

All studies included randomized control trials conducted in the United States. The sample sizes ranged from 40 to 196 participants. The procedures included Core needle breast biopsy ($n = 2$), breast plastic reconstruction ($n = 1$), stereotactic breast biopsy ($n = 1$), and transrectal prostate biopsy ($n = 1$).

Description of meditation

Two of the studies utilized mindfulness-based meditation with guided imagery.^{14,15} Mindfulness may differ from meditation; however, the common core techniques include awareness, acceptance, breathing techniques, a body scan, and the observer technique.¹⁶ Mindfulness meditation brings patients' awareness to themselves, others, and their environment. The breathing technique leads to a regulation of stress with slow and controlled breathing with focused awareness can lead to a calm state. The duration of guided meditation described ranged from 10 to 15 minutes.

Two of the studies utilized loving-kindness meditation (LKM),^{17,18} which focuses on developing positive emotions toward oneself and others while releasing negative emotions. This style of meditation focuses on breath to encourage relaxation and sending positive feelings towards others, like a child or loved one, using the repetition of phrases to direct feelings of love, compassion, and gratitude. The duration of this intervention ranged from 5 to 60 minutes.

The final two studies utilized a guided meditation.^{19,20} The guided meditation focused on breath, nonjudgmental observation of external and internal sensations, and encouragement to refocus awareness to the present moment.

Meditation intervention delivery method and time point

In 5 studies, the intervention was delivered through prerecorded meditations delivered via either a DVD, a digital audio file, or a CD. In one study, the meditations were provided by a mind-body specialist.¹⁴ Meditations were delivered throughout all perioperative phases, including preoperatively, intraoperatively, and postoperatively. The studies that included the postoperative period ranged from 10 hours to 2 weeks.

Measurement and effectiveness of anxiety reduction

Anxiety can be measured through psychological self-reported instruments, physiological indicators such as heart rate and blood pressure, or biochemical markers of hormones and chemicals related to stress.²¹ The majority of the studies utilized patient-reported outcomes, but also included measures of heart rate, inflammatory cytokines, and imaging.

The majority of the studies focused on patients undergoing breast surgery, with one focusing on patients undergoing transrectal prostate biopsy. With the exception of one study that utilized the PROMIS-57²⁰ Anxiety Scale, all of the studies utilized the Visual Analog Scale or the State-Trait Anxiety Inventory (STAI). One study utilized their own four-question survey about pain, anxiety, and discomfort.¹⁵

In intervention groups utilizing meditation, there was a significant decrease in anxiety for the preoperative period utilizing a guided meditation before breast cancer surgery¹⁷ and stereotactic breast biopsy.^{18,19} In the postoperative period, women utilizing LKM postoperatively after a core needle breast biopsy reported a reduction in anxiety and fatigue compared to the standard care group ($P < 0.05$).¹⁸ Although both groups reported an improvement in postoperative anxiety after massage and

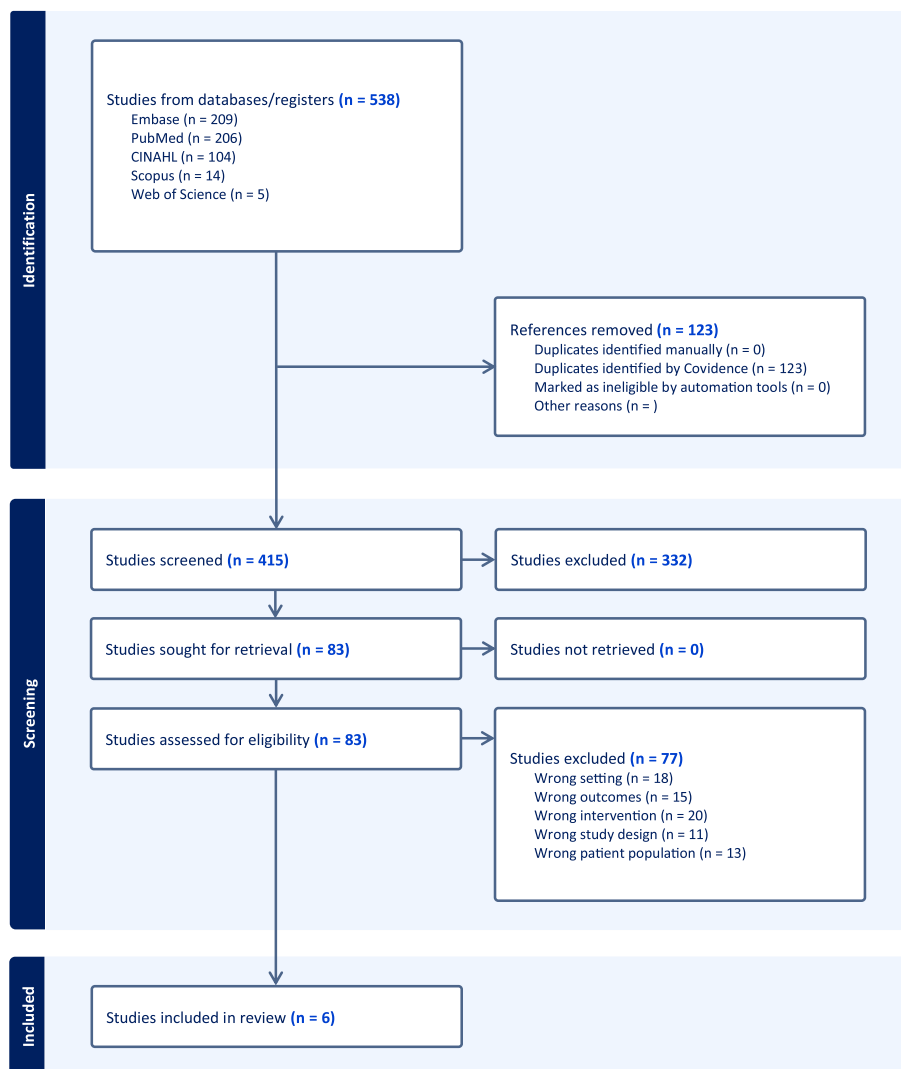


Fig. 1. PRISMA diagram. PRISMA, Preferred Reporting Items for Systematic reviews and Meta-Analyses.

massage combined with meditation, there was no difference between the groups.¹⁴ For patients undergoing core needle biopsy for breast cancer, the LKM intervention group demonstrated a significant reduction in anxiety ($P < 0.05$).^{15,17} The only population that did not demonstrate a difference in anxiety utilizing intraoperative meditation was men presenting for transrectal biopsy.¹⁵

In one study, the researchers investigated whether massage therapy alone or in combination with meditation was more beneficial.¹⁴ The results demonstrated that both groups demonstrated a significant improvement in stress and anxiety, there was no difference between the two groups. However, on postoperative day 3, the group that had massage and meditation had significantly less insomnia.

The majority of the studies utilized patient-reported instruments to measure anxiety. However, one utilized the measurement of inflammatory cytokines secretion.²⁰ The researchers identified that a guided mind-body technique reduced the secretion of inflammatory cytokine secretion in the postoperative period.

Discussion

Undergoing surgery for a cancer diagnosis leads to anxiety. Complementary and integrative therapies, such as meditation may promote a better quality of life, reduce anxiety, and potentially reduce cancer progression through a reduction of the stress response.

Mindfulness meditation emphasizes the intentional focus on the moment in a non-judgmental way and focus on developing greater self-awareness, lowering reactivity in stressful situations, and mindful communication. In a Cochrane meta-analysis of mindfulness-based stress reduction for women diagnosed with breast cancer, the intervention reduces anxiety at the end of the intervention and up to six months later.²² However, it remains unclear the mechanisms through which mindfulness-based interventions impact stress and at what timing and participant characteristics improve intervention acceptability and efficacy.

LKM focuses on developing positive emotions towards oneself and others while releasing negative emotions. The meditation focuses on feelings of gratitude, kindness, and compassion. When using this type of meditation, users are encouraged to repeat phrases directed toward themselves and others.^{17,18} Notably, in addition to the reduction of anxiety, participants who utilized LKM had significantly lower levels of pain and heart rate. These encouraging results demonstrate the potential to decrease levels of inflammation throughout the body and a decreased activation of the stress response.

Future research should continue to integrate biomarkers and other physiologic measures to investigate the potential for meditation to reduce the relationship between stress and cancer progression. Introducing meditation at an acutely stressful time may encourage patients to utilize the techniques longer term and future studies should explore whether there is a sustained improvement over time.

Table 1
Data extraction.

Author, Title	Aim of study	Study design	Type of meditation intervention	Time point	Sample size	Surgery type	Anxiety instrument	Findings	Conclusion
Dion, L et al. Massage therapy alone and in combination with meditation for breast cancer patients undergoing autologous tissue reconstruction: A randomized pilot study.	Explore whether massage combined with meditation is of more benefit than massage therapy alone for stress management in women recovering from autologous tissue reconstruction after mastectomy for breast cancer.	RCT	Mindfulness-based meditation - 15 min DVD about paced breathing	Postoperative day 1, 2, 3 before and after intervention	<i>n</i> = 40. Group 1 massage = 20; Group 2 massage plus meditation = 20	Abdominally based autologous tissue reconstruction breast reconstruction (plastic surgery) following mastectomy	Visual analog scale (VAS) for assessment of stress, anxiety, ability to relax, insomnia, alert-ness, fatigue, tension, pain, mood, and energy (score, 0–10)	Although both groups showed significant improvement after the intervention in most of the parameters measured, no significant difference was found between the 2 groups. Only insomnia on day 3 before and after intervention was significantly better in group 1; however, this was an isolated finding.	Postoperative massage provided favorable effects in patients recovering from reconstructive surgery following mastectomy for breast cancer. Group 1 showed significant improvement in stress, anxiety, relaxation, insomnia, tension, pain, and energy after the first massage session. However, by the second postoperative day before the second intervention, this significant score improvement was lost for stress, relaxation, insomnia, and tension characteristics, although the total score stayed significantly improved. Similar to group 1, group 2 had significant improvement in stress, anxiety, relaxation, insomnia, fatigue, tension, pain, and mood after the first massage plus meditation session.
Soo, M, et al. Imaging-guided core-needle breast biopsy: Impact of meditation and music interventions on patient anxiety, pain, and fatigue.	Evaluation of guided meditation on patient anxiety, pain, fatigue during core need breast biopsy (CNBB) compared to music intervention and standard care group.	RCT	Loving-kindness meditation (LKM)- focuses on developing positive emotions toward oneself and others while releasing negative emotions. LKM were given headphones and throughout the procedures. For the first 5 minutes the recording described the LKM and gave instructions for relaxing. The remainder of the 20 minutes patients were guided to relax, focus on feelings of love, kindness, gratitude and compassion. Patients were encouraged to repeat phrases directed toward themselves and others. After 20 mins the recording was repeated twice, spanning over 1 hour.	Intraoperative	<i>n</i> = 121 LKM = 41 Music = 40 Standard care = 40	Core needle breast biopsy	State-Trait Anxiety Inventory (STAI) 20 item	LKM and music groups reported reduction in anxiety ($P < 0.05$) and reduced fatigue after biopsy when compared to standard care control group. LKM group showed significantly lower pain compared to music group ($P = 0.03$).	LMK significantly lowered biopsy pain during CNBB. LMK and music reduced patient anxiety and fatigue. These interventions could improve women's experiences during CNBB.

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Table 1 (continued)

Author, Title	Aim of study	Study design	Type of meditation intervention	Time point	Sample size	Surgery type	Anxiety instrument	Findings	Conclusion
Stoerker, E, et al. Effectiveness of a self-care toolkit for surgical breast cancer patients in a military treatment facility.	To assess whether a self-care toolkit provided to breast cancer patients undergoing surgery could mitigate distress and lessen symptoms associated with surgery.	RCT	Audio-file of guided mind-body technique (breathing, progressive muscle relaxation, meditation, guided imagery, and self-hypnosis) and acupressure anti nausea wristbands	10 hours postoperative, 2 weeks postoperative	<i>n</i> = 100 women: Self-care toolkit (SCT) in addition to usual medical care = 49) Usual care only = 51)	Breast cancer initial surgery	PROMIS-57 anxiety subscale; General anxiety visual analog scale (GA-VAS)	Clinically significant reductions in anxiety occurred in the SCT group during the main intervention period of baseline to preoperative.	The SCT in the perioperative period decreased pain perceptions, fatigue, and inflammatory cytokines secretion.
Wren, A. et al. Preliminary efficacy of a lovingkindness meditation intervention for patients undergoing biopsy and breast cancer surgery: A randomized controlled pilot study.	Examined the effect of a brief lovingkindness meditation (LKM) intervention on anxiety, body pain, breast pain, fatigue, physiological reactivity, and self compassion.	RCT	Lovingkindness meditation (LMK) develops positive emotions towards oneself and others and releases negative emotions. It focuses on the breath to encourage relaxation and sending positive feelings towards others (child or loved one). Meditation included repetition of phrases to direct feelings of love, compassion and gratitude. Participants used headphones during the biopsy and listened to the study developed LKM. After the procedure patients were given a CD of the LKM practices: 20 min guided meditation, 5 min guided meditation, informal meditation instruction. Participants were asked to practice for up to 20 mins daily.	Preoperative; intraoperative; postoperative; other: The intervention was provided during the procedure. The patient received pre assessment questionnaires. Post procedure patients received a 2nd assessment. A 3rd assessment was provided if the patients received abnormal/cancerous results.	<i>n</i> = 56 LKM = 23 Music = 16 Usual care = 17	Core needle breast biopsy (CNBB)	State-Trait Anxiety Inventory (STAI)	LKM group significantly improved pain (<i>P</i> = 0.02), self-compassion (<i>P</i> = 0.004), and heart rate (<i>P</i> = 0.02) over time compared to control conditions. Usual care (UC) group showed greater increases in anxiety over time compared to LKM. Music significantly improved pain (<i>P</i> = 0.04) compared to UC.	These findings provide preliminary evidence for the feasibility and efficacy of a LKM intervention for breast cancer patients during the diagnostic and surgical period. LKM can improve negative physical symptoms and may impact anxiety. Body pain remained stable with the LKM and music intervention while it was increased with the usual care group.
Ratcliff, C. et al. A randomized controlled trial of brief mindfulness meditation for women undergoing stereotactic breast biopsy.	Examined the effect of a brief, guided mindfulness-based meditation (GM) compared with guided focused breathing (FB) or standard care (SC) on self-reported anxiety and pain and EEG activity in participants undergoing SBB. 1. Hypothesis: GM would result in lower anxiety and pain prebiopsy and a steeper reduction in anxiety and pain during the	RCT	Guided meditation (GM) group: Focused on breath, nonjudgmental observation of external and internal sensations and encouragement to refocus awareness to the present moment. Guided focused breathing (FB): Control group that participants were guided to engage in slow, diaphragmatic breathing. A mind-body specialist trained in both interventions led GM and FB participants for 10 min	Preoperative; intraoperative	<i>n</i> = 76 GM = 30 FB = 30 SC = 16	Stereotactic breast biopsy (SBB)	State-Trait Anxiety Inventory (STAI) VAS of anxiety	Women in the GM group reported a steeper reduction in anxiety than women in the FB and SC groups (<i>P</i> < 0.001 for all, Cohen's <i>d</i> > 0.4 for all). There were no group differences in pain ratings during the biopsy. Women in the GM and FB groups experienced a nonsignificant decrease in delta	Brief, guided meditation may provide effective anxiety relief during an acute medical procedure and affect neuronal activity in regions associated with attention (anterior cingulate cortex), self-awareness (insula and precuneus), and emotion regulation (medial prefrontal cortex).

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Table 1 (continued)

Author, Title	Aim of study	Study design	Type of meditation intervention	Time point	Sample size	Surgery type	Anxiety instrument	Findings	Conclusion
	<p>biopsy than FB and SC.</p> <p>2. Hypothesis: GM would result in increased EEG activity from baseline during the biopsy in four regions of interest (ROIs) – The mPFC, insula, ACC, and precuneus – compared with FB and SC.</p> <p>3. Hypothesis: Increases in EEG activity during the biopsy would be associated with a steeper reduction in self-reported anxiety and pain during the biopsy.</p>		<p>before SBB.</p> <p>A mind-body specialist was present during the procedure for the GM and FB groups. The specialist guided the participants through the procedure.</p>					<p>activity in the precuneus during biopsy compared with those in the SC group ($P < 0.40$ for both, Cohen's $d > 0.6$ for both), which was associated with a steeper reduction in anxiety during the biopsy ($r = 0.51$, $P < 0.01$).</p>	
Gaffney, C. et al. A brief mind-body intervention to reduce pain and anxiety during prostate needle biopsy: a Clinically integrated randomized controlled trial with 2-staged consent.	A brief guided mind-body intervention would improve patient reported pain, anxiety, discomfort, and tolerability of prostate biopsy compared with usual care.	RCT	<p>Mind-body intervention delivered via headphones that combined mindfulness meditation with a component of guided imagery.</p> <p>1. Prebiopsy: Patients listened to a mindfulness exercise for 10 minutes.</p> <p>2. During the biopsy: Patients listened to a program that guided them through a 10-min mindfulness intervention.</p>	Preoperative; intraoperative	<p>$n = 196$</p> <p>Treatment group with mind body intervention = 102; Control group with usual care = 94</p>	Transrectal prostate biopsy	4 question survey about pain, anxiety and discomfort	<p>A total of 37/94 (39%) and 38/102 (37%) patients randomized to usual care and intervention, respectively, reported severe scores in any of the 4 domains, a difference of 2.1% (95% confidence interval [CI] –13%, 17%, $P = 0.8$).</p> <p>There was no evidence of a difference in mean post biopsy anxiety ($P = 0.3$), discomfort ($P = 0.09$), pain ($P = 0.4$) or tolerability scores ($P = 0.2$).</p>	The researchers did not find a clinically meaningful benefit for the brief mind-body intervention during prostate biopsy.

Conclusions

For patients undergoing oncology surgery, the perioperative period can be filled with anxiety. Guided, mindfulness, and LKM may be helpful in reducing anxiety, particularly in patients undergoing surgery for breast cancer during the postoperative period. However, the current literature is extremely limited. Future research should expand on the preliminary effectiveness to broader populations and carefully target the highest-risk populations for the ideal time point for interventions.

Ethics statement

Not required.

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CRedit authorship contribution statement

Conceptualization, JM, CV, JO, SY, JC.; methodology, JM, CV, JO, SY, JC; investigation, JM, CV, JO, SY, JC; writing – original draft preparation, JM, CV, JO, SY, JC; writing – review and editing, JM, CV, JO, SY, JC; supervision, SY, JC. All authors had full access to all the data in the study, and the corresponding author had final responsibility for the decision to submit for publication. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability statement

Data availability is not applicable to this article as no new data were created or analyzed in this study.

Declaration of generative AI and AI-assisted technologies in the writing process

No AI tools/services were used during the preparation of this work.

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