

Article

Progressive Muscle Relaxation (PMR) in Cancer Patients: A Scoping Review

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ABSTRACT

Background: Cancer patients frequently endure a range of physical and psychological burdens during treatment. Progressive Muscle Relaxation (PMR) is utilized as a supportive intervention to address these symptoms, though its specific implementation and efficacy require synthesis.

Objectives: This scoping review aims to investigate the implementation strategies and the effects of PMR on physical and psychological outcomes in patients diagnosed with cancer.

Method: Following PRISMA and Joanna Briggs Institute (JBI) guidelines, a comprehensive literature search was conducted for articles published between 2019 and 2024. Inclusion criteria required studies to be in English or Indonesian and utilize specific designs, including quasi-experimental and randomized controlled trials (RCTs).

Results: From a total of 792 initial records, 15 studies met the inclusion criteria. These studies, conducted across various countries, typically utilized PMR interventions lasting 15–25 minutes. The analysis indicated that PMR was associated with reductions in physical symptoms, such as pain, fatigue, nausea, vomiting, and dyspnea. Furthermore, significant improvements were noted in psychological symptoms, including anxiety, stress, and emotional distress, alongside positive effects on sleep quality, functional well-being, coping mechanisms, and resilience.

Conclusion: PMR shows promise as a beneficial intervention for alleviating symptom burden in cancer patients. However, the limited number of studies and methodological heterogeneity suggest a need for further rigorous research to clarify the mechanisms of action and expand its clinical applications.

Keywords: Progressive muscle relaxation (PMR), Cancer patients, Physical symptoms, Psychological symptoms; Quality of life

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INTRODUCTION

The population requiring Progressive Muscle Relaxation (PMR) intervention is broad, encompassing patients with hypertension, diabetes, mental disorders, anxiety, and even terminally ill patients. Each of these conditions is often accompanied by significant physical and emotional symptoms, such as muscle tension, anxiety, stress, and sleep disturbances, which can worsen quality of life and slow recovery (Toussaint et al., 2021). For example, in patients with hypertension and diabetes, stress can lead to increased blood pressure or worsen blood sugar levels (Nur & Anggraini, 2022). For terminally ill patients, who face pain and fatigue,

PMR can provide support in relieving physical and psychological stress (Anshasi et al., 2023) . Therefore, PMR is an important intervention for managing physical and psychological symptoms in a variety of medical conditions, helping patients feel calmer and improve their quality of life, both for those with long-term conditions and those in the terminal phase (Mochamat et al., 2021) .

PMR is a nursing intervention that aims to relax tense muscles through two stages. The first stage involves tensing the muscle, followed by the second stage, releasing the tension and focusing attention on the muscle, thus promoting relaxation. PMR has been shown to be effective in reducing physical and mental tension in cancer patients (Suryani et al., 2022) , who often experience physical and emotional problems such as pain, fatigue, anxiety, and difficulty sleeping. Muscle tension often arises from stress or side effects of treatments such as chemotherapy or radiation (Rustam et al., 2024). In addition to relieving physical symptoms, PMR also reduces anxiety related to the uncertainty of the disease and treatment, and improves sleep quality in cancer patients, which is essential for recovery (Pelekasis et al., 2017) . Thus, PMR offers a relevant non-pharmacological alternative for cancer patients, providing a safe and natural solution to improve their quality of life.

Many studies have been conducted to examine the effects of Progressive Muscle Relaxation (PMR) on cancer patients with various medical conditions. Research by Gupta et al. explored the effect of PMR on the functional status of cancer patients undergoing chemotherapy, with results showing a significant impact on improving the patients' functional status across physical, psychological, and social aspects (Gupta et al., 2016) . Other studies have found PMR to be effective in reducing pain in cancer patients, particularly in late-stage cancer, breast cancer, and cervical cancer patients . (De Paolis et al., 2019) . Furthermore, research by Larasati et al. explored complementary interventions to reduce fatigue and improve quality of life in cancer patients. In this study, PMR was discussed as one of the interventions, with results showing a significant impact on reducing fatigue and improving quality of life. In addition to PMR, other interventions explored included aerobic exercise, dance, back massage, effleurage massage, and music therapy (Larasati & Noni, 2022) .

Based on existing studies, PMR has been shown to provide significant benefits for cancer patients in addressing various physical and psychological issues, including improving functional status and reducing anxiety, nausea, vomiting, fatigue, and pain, ultimately improving patients' quality of life. Although the evidence for the benefits of PMR is quite strong, several research gaps remain that need to be addressed, particularly the limited number of studies describing how PMR is implemented. Many studies have discussed PMR alongside other interventions, such as aerobic exercise and music therapy, but there are few studies directly comparing the effectiveness of PMR in the overall cancer context. Furthermore, most studies have focused on specific cancer patient groups, such as breast or cervical cancer, resulting in limited research encompassing a more diverse population of cancer patients, including those with terminal or rare cancers. Therefore, the purpose of this scoping review is to identify and assess the application of PMR in cancer patients and to address gaps in the literature regarding the effects of PMR in broader clinical practice.

METHODS

Study Design

This scoping review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines. The study followed the structured methodological framework established by the Joanna Briggs Institute (JBI) for evidence synthesis. This framework consists of five essential stages: formulating the research question, identifying relevant publications, selecting eligible studies, charting the extracted data, and summarizing the findings to provide a comprehensive overview of the current evidence.

Eligibility Criteria

The research problem was structured using the PICO (Population, Intervention, Comparison, and Outcome) strategy to ensure a focused and systematic search. The study population consisted specifically of cancer patients of all ages, with the primary intervention identified as Progressive Muscle Relaxation (PMR). The comparison included standard care, placebo, or no-intervention groups, while the measured outcomes focused on the reduction of distressing cancer-related symptoms, such as pain, fatigue, nausea, vomiting, anxiety, and functional performance.

Search Strategy and Databases

A comprehensive literature search was executed across four major electronic databases: PubMed, Elsevier (ScienceDirect), ProQuest, and Google Scholar. The search strategy utilized the Boolean operator method to combine key terms and ensure maximum retrieval of relevant articles. The specific search string employed was: ("Progressive Muscle Relaxation" AND "Cancer") AND ("Pain" OR "Fatigue" OR "Nausea" OR "Anxiety" OR "Functional Performance" OR "Stress").

Study Selection and Inclusion Criteria

Rigorous inclusion and exclusion criteria were applied to the retrieved publications to ensure the quality and relevance of the evidence. Eligible articles included those published in either Indonesian or English between the years 2019 and 2024 that provided full-text access. The review focused exclusively on primary research using Randomized Controlled Trials (RCTs) or Quasi-Experimental methods to maintain high methodological standards. Conversely, theses, case studies, pre-experimental research, and other literature reviews were excluded from the final analysis.

Data Extraction and Analysis

To minimize the risk of selection bias, four authors independently collected the study characteristics, which were subsequently reviewed in a collective session to reach a consensus. The data charting process involved extracting specific details, including the author, country, year of publication, study design, population characteristics, and the specific instruments used to measure outcomes. The final analysis involved mapping these results against the formulated research questions to synthesize the effectiveness of PMR in oncology care.

RESULTS

The article search yielded 792 articles across four databases, 650 (82.07%) of which were removed as duplicates (the same article in each database was eliminated). Of the remaining 142 articles, 42 (5.30%) did not meet the inclusion criteria and were excluded. The reference lists and citations of 100 (12.63) published articles were then screened: 5 theses, 10 case studies, 35 pre-experimental articles, and 20 review articles. Sixteen articles met the full eligibility criteria and were included in the final review. A PRISMA flowchart, depicting the search strategy and selection scheme, is shown in Figure 1. As shown in Table 1, 15 studies were conducted in 7 countries: three from India, two from Turkey, six from Indonesia, and one each from Italy, Vietnam, Thailand, and Saudi Arabia. The included studies used randomized controlled trials (n=6) and quasi-experimental methods (n=9).

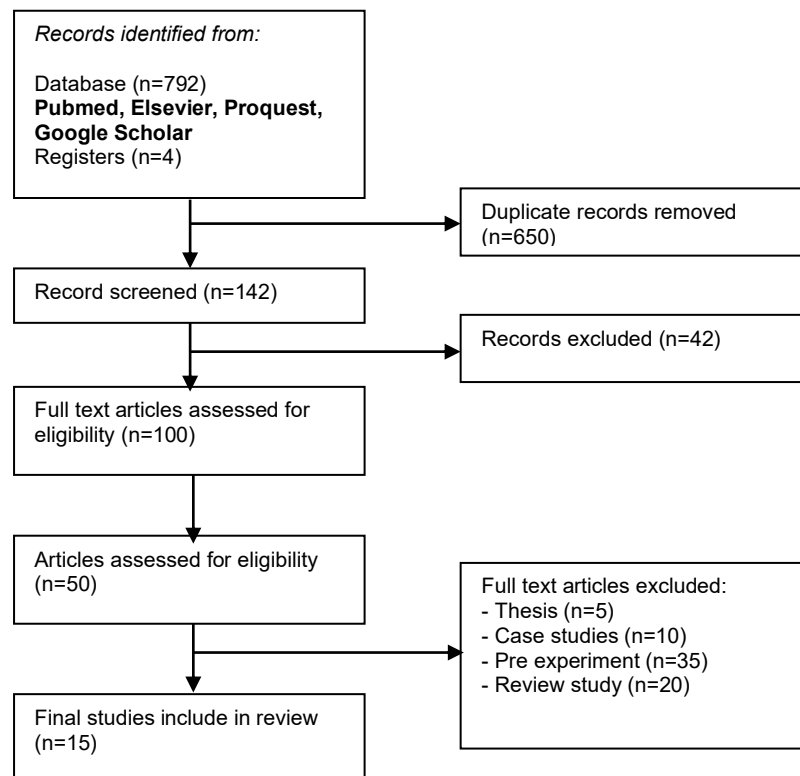


Figure 1. Prisma Flowchart for Scoping Review

Study characteristics

The 15 studies included in this scoping review came from various countries, including: India (5 studies), Indonesia (6 studies), Turkey (2 studies), Vietnam (1 study), Thailand (1 study), and Saudi Arabia (1 study). The research methods used varied, with most studies using quasi-experimental designs (9 studies), and the remainder using randomized controlled trial (RCT) designs (6 studies). Sample sizes also varied, ranging from 19 to 148 respondents (Table 1).

Table 1. Study characteristics of included studies

| Author, Year | Country | Research methods | Sample Size |
|-------------------------------|------------|--------------------|-------------|
| (Kugali et al., 2023) | India | Quasi-experimental | 30 |
| (Jaya & Thakur, 2020) | India | RCT | 50 |
| (Sari et al., 2024) | Türkiye | RCT | 69 |
| (Bhatia et al., 2020) | India | Quasi-experimental | 40 |
| (Kartika et al., 2022) | Indonesia | Quasi-experimental | 34 |
| (Mardiana et al., 2020) | Indonesia | Quasi-experimental | 19 |
| (Anggraini et al., 2023) | Indonesia | Quasi-experimental | 78 |
| (Nguyen et al., 2023) | Vietnamese | RCT | 24 |
| (Nurkayatun & Fitriani, 2021) | Indonesia | Quasi-experimental | 36 |
| (De Paolis et al., 2019) | Italy | RCT | 104 |
| (Z, 2022) | Indonesia | Quasi-experimental | 30 |
| (Sutinah et al., 2021) | Indonesia | Quasi-experimental | 62 |
| (Vuttanon et al., 2019) | Thailand | Quasi-experimental | 96 |
| (Anshasi et al., 2023) | Arab | RCT | 148 |
| (Turan et al., 2024) | Turki | RCT | 74 |

Description of the Progressive Muscle Relaxation Intervention Model

The fifteen studies used a relatively consistent PMR intervention duration of 15–25 minutes. There was no significant variation in the reported PMR implementation methods among the studies. However, details regarding the specific PMR implementation protocols were not always reported consistently across the studies (Table 2).

Effects of Progressive Muscle Relaxation (PMR) on Physical Symptoms

Eight studies (Kugali et al., 2023; Jaya & Thakur (2020); Sari et al. (2024); Bhatia et al. (2020); Kartika et al. (2022); Anggraini et al. (2023); Nurkayatun & Fitriani (2021); Turan et al. (2024)) evaluated the impact of PMR on various physical symptoms. These studies demonstrated potential reductions in pain (using various measurement instruments such as the Numeric Rating Scale, Visual Analog Scale, and Universal Pain Assessment Tool), fatigue (Fatigue Symptom Inventory/FSI and Brief Fatigue Inventory/BFI), nausea and vomiting (MAT and Adverse Events Version-5), and dyspnea (Medical Research Council Dyspnea Scale). However, the consistency of the findings and the strength of the evidence require further evaluation.

Effects of Progressive Muscle Relaxation (PMR) on Psychological Symptoms

Eleven studies (Kugali et al., 2023; Jaya & Thakur, 2020; Nguyen et al., 2023; Nurkayatun & Fitriani, 2021; Ricky, 2022; Sutinah et al., 2021; Vuttanon et al., 2019; Anshasi et al., 2023; Mardiana et al., 2020; Anggraini et al., 2023; Paolis et al., 2019) examined the effect of PMR on psychological symptoms. The results showed potential reductions in anxiety (using instruments such as the State-Trait Anxiety Inventory (STAI), Hospital Anxiety and Depression Scale (HADS), DASS-21, and the Anxiety Questionnaire), stress and distress (Cohen's Perceived Stress Scale

and HADS), and emotional distress (ESAS Score). The variety of research instruments and methodologies requires further analysis to determine the overall strength of the evidence.

Table 2. PMR intervention model and effects

| Author (Year) | PMR duration (minutes) | Physical Symptoms | Psychological Symptoms | Common Symptoms |
|------------------------------|------------------------|---------------------------------|---------------------------|-------------------------|
| Kugali et al. (2023) | 15-25 | Pain, Nausea/Vomiting | Anxiety, Stress | Functional Well-being |
| Jaya & Thakur (2020) | 15-25 | Pain, Fatigue | Anxiety, Stress | |
| Sari et al. (2024) | 15-25 | Pain, Sleep Quality | | |
| Bhatia et al. (2020) | 15-25 | Painful | | Sleep Quality, Insomnia |
| Kartika et al. (2022) | 15-25 | Pain, Fatigue, Nausea/Vomiting | | Performance |
| Mardiana et al. (2020) | 15-25 | Painful | | |
| Anggraini et al. (2023) | 15-25 | Pain, Fatigue | | |
| Nguyen et al. (2023) | 15-25 | Painful | Anxiety, Stress | Functional Well-being |
| Nurkayatun & Fitriani (2021) | 15-25 | Pain, Fatigue | Anxiety | |
| Paolis et al. (2019) | 15-25 | Painful | | |
| Ricky (2022) | 15-25 | Painful | Anxiety | |
| Sutinah et al. (2021) | 15-25 | Painful | Anxiety | |
| Vuttanon et al. (2019) | 15-25 | Pain, Fatigue, Nausea/Vomiting | Anxiety | Coping, Resilience |
| Anshasi et al. (2023) | 15-25 | Pain, Nausea/Vomiting, Appetite | Anxiety, Emotional Stress | |
| Turan et al. (2024) | 15-25 | Pain, Dyspnea, Sleep Quality | | |

Effects of Progressive Muscle Relaxation (PMR) on Common Symptoms

Four studies (Sari et al., 2024; Bhatia et al., 2020; Kugali et al., 2023; Nguyen et al., 2023) explored the impact of PMR on a variety of common symptoms. These studies demonstrated potential improvements in sleep quality (Pittsburgh Sleep Quality Index/PSQI), functional well-being (FACT-G), performance (Karnofsky Performance Status Scale), coping and resilience (The 14-item Resilience Scale and The Cancer Coping Questionnaire), and insomnia (Insomnia Severity Index Scale). More research is needed to confirm these findings and determine their generalizability to broader patient populations.

DISCUSSION

Based on the findings of this review, PMR shows significant potential as a non-pharmacological intervention in symptom management in cancer patients. An analysis of 15 studies showed that PMR is effective in reducing a variety of physical symptoms, including pain, fatigue, nausea and vomiting, and dyspnea. Furthermore, PMR also demonstrated positive effects on psychological symptoms such as anxiety and stress, as well as improving sleep quality and other aspects of quality of life. These results support the application of PMR as a complementary strategy in cancer care to improve patients' physical and psychological well-being.

The provision of PMR intervention has been proven to provide significant results in reducing the side effects of chemotherapy procedures in cancer patients. Chemotherapy and radiotherapy are therapeutic modalities in cancer patients, the effects of the drugs used can cause neuropathy (Miltenburg & Boogerd, 2014). Activation of satellite glial cells (SGC) in the dorsal root ganglion affects the transmission of pain signals and increases sensitivity to pain stimuli. This makes the body more susceptible to pain. PMR is recommended to reduce pain by relaxing muscles so that the parasympathetic system dominates, reducing heart rate, respiratory rate, and blood pressure (Tan et al., 2022). This relaxation also affects the somatic and autonomic nervous systems, reducing anxiety, and potentially reducing tissue oxygen demand and lactic acid levels. It also stimulates the release of endorphins that inhibit pain transmission through opioid receptors (Fitria et al., 2024). The complex interaction between the autonomic nervous system, hypothalamus, and cerebral cortex modulates pain signals through the release of enkephalins and endorphins.

The process of reducing anxiety levels through PMR relaxation with self-management techniques works based on the regulation of the sympathetic and parasympathetic nervous systems (Muhammad Khir et al., 2024). The sympathetic nervous system is active when the body needs energy, such as when anxious, afraid, or tense, for example in chemotherapy patients who often experience anxiety due to the direct or side effects of drugs (Fitria et al., 2024). In this condition, blood flow to the muscles increases, the heart rate increases, and sugar levels increase. PMR relaxation stimulates the parasympathetic nervous system, helping the body calm, and affects neurotransmitters such as norepinephrine, serotonin, and GABA, which play a role in regulating anxiety through brain structures such as the amygdala, hippocampus, and cerebral cortex (Nguyen et al., 2023).

Nausea and vomiting in cancer patients undergoing chemotherapy are often caused by stimulation of the autonomic nervous system, particularly activation of the sympathetic nervous system. The PMR technique effectively reduces sympathetic nervous system activity and promotes relaxation (Tian et al., 2020). When the body is in a relaxed state, muscle tension is reduced and levels of stress hormones such as cortisol, which contribute to nausea and vomiting, are lowered. PMR also stimulates the release of endorphins, which act as natural analgesics, reducing the perception of pain and discomfort (Samami et al., 2022). PMR decreases sympathetic nervous system activity by reducing signals that trigger the vomiting center in the central nervous system (Jahn et al., 2022). This activity results in a

reduction in the frequency and intensity of nausea and vomiting, allowing patients to feel more comfortable after chemotherapy.

Sleep quality in cancer patients is often disrupted by the side effects of chemotherapy, including nausea and stress. PMR helps improve sleep quality by creating a state of relaxation that supports deeper sleep (Sulistyawati et al., 2021). The relaxation process produced by PMR techniques decreases sympathetic nervous system activity and increases parasympathetic nervous system activity, promoting a state of calm and comfort. This technique involves sequential muscle contraction and relaxation, which stimulates the release of endorphins, the body's natural chemicals that function as analgesics. Reducing stress and muscle tension contributes to increased sleep duration and quality, ultimately improving the overall quality of life for cancer patients undergoing chemotherapy. (Sari et al., 2024).

Overall, PMR can serve as an integral component in cancer symptom management, offering renewed hope to patients and their families in facing the challenges posed by this disease (Loh et al., 2022). PMR, within a broader approach, can be used as an intervention to improve cancer patient care and provide better support in their recovery process. The success of this intervention also depends heavily on active patient engagement, as well as support from the medical team and family. Openness to trying various methods that can improve psychological and physical well-being will be key to achieving optimal outcomes (Sinha et al., 2021).

Further research is needed to explore the mechanisms underlying PMR's effectiveness. Additional research could help understand how PMR works in combination with other complementary therapies. With a better understanding, PMR interventions can be optimized and implemented more effectively in clinical practice.

CONCLUSION

This scoping review demonstrates the significant potential of Progressive Muscle Relaxation (PMR) in reducing physical (pain, fatigue, nausea/vomiting, dyspnea) and psychological (anxiety, stress) symptoms in cancer patients, as well as improving sleep and quality of life. While the results are promising, the methodological heterogeneity and limited sample sizes of the reviewed studies warrant further research with more robust designs (e.g., RCTs with larger sample sizes and standardized PMR protocols) to confirm the findings and investigate the mechanisms of action of PMR and potential synergy with conventional therapies. Additional research will help optimize the application of PMR in clinical practice to improve the well-being of cancer patients.

CONFLICT OF INTEREST

The authors stated there is no conflict of interest in this study.

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