Review

The Effectiveness of Using Progressive Muscle Relaxation Techniques on Quality of Life, Stress, And Anxiety Among Acute Myocardial Infarction: A Systematic Review

Ala'a A. Al-yyan, Ayat A. ELayan, Mohammad Saleh [*]

School of Nursing, the University of Jordan, Amman, Jordan; E-Mails: alaaalyyan94@yahoo.com; Aya8200543@ju.edu.jo; m.saleh@ju.edu.jo; ORCID: 0009-0003-4002-5675; 0000-0003-2986-9626

* **Correspondence:** Mohammad Saleh; E-Mail: m.saleh@ju.edu.jo

Academic Editor: Félix Fernando Monteiro Neto

Abstract

The progressive muscle relaxation technique (PMRT) is an active method that is defined as a technique through which individuals gradually cause a feeling of quietness and coolness by actively contracting and loosening specific muscle groups. The purpose of this study was to review the effectiveness of using progressive muscle relaxation techniques on quality of life, stress, and anxiety levels among Acute Myocardial Infarction patients. A systematic review of randomized controlled trials (2013-2023). Databases of Pub Med through (Medline), EBSCO, and Cochrane Library were conducted for trials of progressive muscle relaxation techniques on quality of life, stress, and anxiety levels as clinical outcomes. Data extraction and quality appraisal were performed and verified. The Cochrane Risk of Bias instrument tool was used to appraise the selected articles critically. Seven out of 40 studies included 420 patients who met the inclusion criteria. The progressive muscle relaxation technique is more effective and statistically significant regarding quality of life ($p < 0.05$). Stress as an outcome was decreased after PMRT ($p < 0.05$), and anxiety levels ($p = 0.001$). The progressive muscle relaxation technique revealed a significant effect on patients' quality of life, stress, and anxiety levels. However, results need to be confirmed using more high-quality RCTs. Therefore, frequent evaluation is suggested for the available primary studies to prove the findings. Applying the PMRT as part of the cardiac rehabilitation program will help in enhancing patient outcomes.

A combination of PMRT with other interventions will increase the efficacy of the PMRT. Follow-up in the long term will improve the generalizability of the findings for MI patients and among different patients with other cardiac diseases.

Keywords
Progressive muscles relaxation technique; stress; anxiety; quality of life; myocardial infarction; cardiac rehabilitation

1. Introduction

Cardiovascular diseases (CVDs) are the leading cause of death all over the world [1], accounting for 17.9 million deaths annually [2], which costs the healthcare system about a trillion dollars, directly and indirectly, to treat patients with CVDs [3].

Myocardial infarction (MI) is a worldwide burden, and it has been mentioned as an emerging situation for 25 years. It is accountable for several deaths and disabilities globally and harmfully affects patients' quality of life [4]. The current prevalence of MI is 194 million cases, increasing over time [5].

Myocardial infarction is an acute, progressive disease in which part of the heart muscle is damaged or dead due to decreased blood flow and oxygen to heart cells [6], in which the heart cannot meet its required demands [7]. According to the current review, the Middle East has a greater prevalence of MI (10.1%) than the global average (3.8%) [8].

Myocardial Infarction has a global burden and is considered the main reason for hospital admissions [9]. About 194 million people are diagnosed with MI around the world, and it primarily affects older age, but the incidence among younger age is increasing. While females have a statically lower incidence rate of MI than males, no difference between both is reported across the middle-aged population [10].

Every 40 seconds, a person will have MI [11]. The risk factors for MI, according to the American Heart Association in 2019, are hypertension at 45.6%, obesity at 39.6%, smoking at 15.5%, chronic kidney disease at 14.8%, and diabetes mellitus at 9.8%. Moreover, the rate of MI in the Arab population is vulnerable to the disease, and the risk increases with age as well as lifestyle. The number of heart failure patients is expected to increase dramatically [12]. Differences in the Arab countries' lifestyles and socioeconomic conditions and in rural and urban areas within countries may explain the findings' heterogeneity, which agrees with the previously reported evidence that there is geographic variance in MI prevalence [13].

Non-pharmacologic and pharmacologic interventions could be applied to prevent stress and anxiety and improve the quality of life among MI patients [14]. PMRT is one of the non-pharmacological interventions that can reduce fatigue among MI patients.

Instead of traditional management for stress and anxiety results of MI and improving quality of life, mental and behavioral interventions are needed, which are considered safe interventions rather than pharmacological interventions [15]. Progressive muscle relaxation(PMR) is one of these interventions developed by Edmund Jacobson in 1939. Jacobson mentioned that muscle relaxation prevents negative idea formation, enhances the mind's peace, and prevents the creation of

undesirable feelings and emotions such as stress and anxiety. It also balances the effect of increased muscle pressure and induces relaxation [16]. This technique involved 30 muscles and took numerous sessions to train. Progressive muscle relaxation involves an alternative method that allows the body muscles to relax by starting in the upper part and then going to the lower part. It also contains deep breathing exercises to feel the relaxation in the body as a whole [16].

Application of Progressive Muscle Relaxation Training (PMRT) has recently become a critical measure as part of patients caring with chronic disease due to its benefits such as reducing anxiety and stress, removing attention away from pain, decreasing muscle tension and enhancing relaxation, minimizing levels of fatigue and pain, improving quality of life [15, 17, 18].

The progressive muscle relaxation technique is best known as the active relaxation technique through which an individual gradually causes a feeling of quietness and coolness in themselves by actively contracting and loosening specific muscle groups [19].

The intervention was initially developed by Dr. Edmund Jacobson in 1939. The PMRT helps different muscle groups tense and relax throughout the body, creating a deep state of relaxation. The PMRT involves tensing up the one-by-one muscle groups for about 5 seconds and then relaxing for about 10 seconds. Breathing exercises are accompanied by this exercise to feel a sense of relaxation. PMRT refers to tensing and relaxing the muscles from the head to the feet individually, including 11 muscle groups (right arm, left arm, forehead, jaw, neck, back and shoulders, stomach, thighs, right calf, left calf, right foot, and left foot). The total exercise takes about 20-25 min.

The literature reviewed the effects of PMRT as a crucial non-pharmacological intervention for patients with several chronic diseases but not yet for myocardial infarction patients. The results of this study will address the effects of PMRT quality of life, stress, and anxiety levels among patients with MI in Jordan. Many studies show a positive therapeutic effect of PMRT on reducing stress and anxiety levels and improving quality of life. PMRT technique has not been used as a rehabilitation therapy among MI patients who are patients suffering from severe adverse effects of stress and anxiety on their quality of life. Despite that, MI patients do not practice the PMRT yet because there is a lack of evidence on the effects of this maneuver in our healthcare system.

Relaxation techniques recently were developed in emerging studies as inter/intradisciplinary interventions for improving quality of life and reducing stress and anxiety levels [20]. A total of 18 relaxation techniques are applied as non-pharmacological treatment. Still, progressive muscle relaxation (PMR) is more accessible and more straightforward to use by patients because it is costless, self-administered, reachable, and has no side effects [21]. The previous systematic reviews on PMRT have been focused on the effectiveness of the intervention on physical symptoms such as cancer and undergoing operations, not on mental or behavioral symptoms [22]. However, keep in mind that there are no systematic reviews that evaluate the effectiveness of PMRT interventions on stress, anxiety, and quality of life of MI patients together, thus contributing to the current body of knowledge.

Like the global figures, the Arab world faced challenges with CVDs. It is one of the top five causes of death in the all-ages group. The burden of CVDs in Arab countries is 13.6 in low-income countries (LICs) and 59.1 in middle-income countries (MICs) [23]. According to the Global Burden of Disease Study, the incidence of CVDs has increased in the Arab world, taking into consideration the difference in location and income [24]. Controlling risk factors is one of the most effective solutions to prevent CVD numbers from trending up. Smoking is one of the significant risk factors in the Arab World. Nine Arab countries (Bahrain, Egypt, Jordan, Kuwait, Lebanon, Libya, occupied Palestinian

territory, Tunisia, and Syria) have a high prevalence of daily smoking, which exceeds 30% in men, and obesity, which exceeds in women [25]. Arab governments are trying to respond to the global health institutions, but Poverty, insurance, sex variation, political issues, and lack of responsibility are active challenges in controlling CVDs.

Hence, the purpose of this study was to review the effectiveness of using progressive muscle relaxation techniques on quality of life**,** stress, and anxiety levels among Acute Myocardial Infarction patients.

2. Methods

This systematic review was designed to assess the effectiveness of using progressive muscle relaxation techniques on quality of life, stress, and anxiety levels among myocardial infarction patients in the Arab World. All published papers were searched in major international databases, namely, PubMed through MedLine, EBSCO, and Cochrane Library. The Initial search started on Aug 15th, 2023, and the last search was run out on Oct 15th, 2023. Variables were recorded according to the medical subject heading (MeSH) to distinguish research articles. Keywords were searched, "progressive muscles relaxation technique", "stress", "anxiety", "quality of life", "myocardial infarction", and "cardiac rehabilitation".

Keywords were searched together to detect other publications. Additionally, reference lists of eligible articles were also searched. Seven articles that matched the inclusion criteria were chosen from a review of 40 articles that discussed the effectiveness of progressive muscle relaxation techniques on quality of life, stress, and anxiety levels among myocardial infarction patients, as shown in Figure 1.
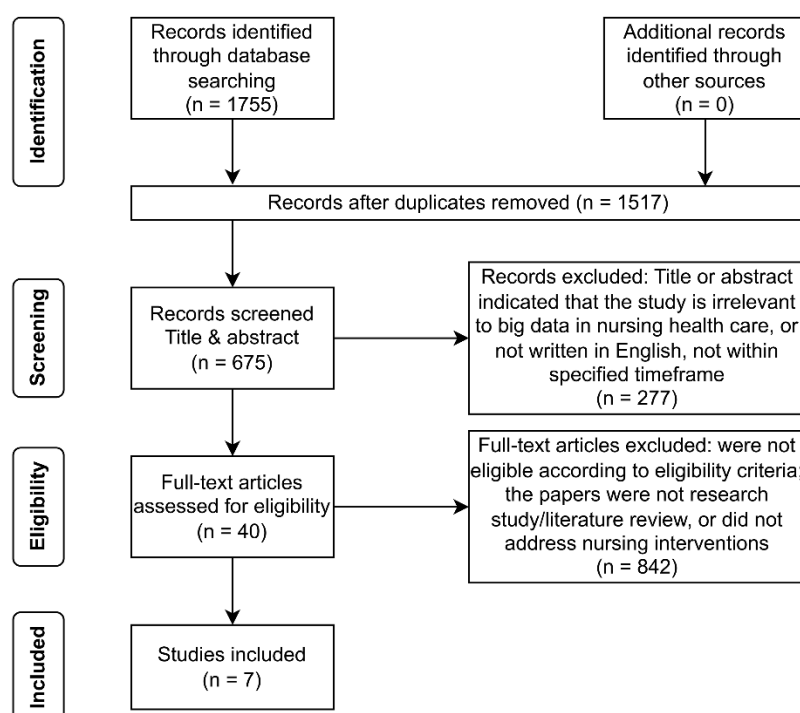

Figure 1 PRISMA Diagram of search results. A modified version of the PRISMA flow diagram [26].

2.1 Inclusion and Exclusion Criteria

The inclusion criteria for this review were (1) published full articles within the last 10 years. The choice of such a publication timeframe was to ensure the most recent and relevant literature available on the effects of PMRT on the quality of patient's life, stress, and anxiety among patients post Myocardial infarction. This timeframe allows researchers to capture the latest advancements, theories, and methodologies that have emerged since studying such phenomena in the Arab world. Additional rationale for including a specific timeframe study is the availability of literature that influences the PMRT and QoL, stress, and anxiety among MI patients. (2) randomized controlled trials in the methodology, (3) published in English. (4) applying PMRT as an intervention among cardiac patients. However, papers were posted as conferences, editorial papers, case reports, and articles without full text, pediatric patients, and articles focusing on more than one intervention rather than PMRT were excluded from the review.

2.2 Study Outcome

The outcome of this review was to present the effectiveness of using progressive muscle relaxation techniques on quality of life**,** stress, and anxiety levels among acute myocardial infarction patients. The progressive muscle relaxation technique is active relaxation, defined as a technique through which individuals gradually cause a feeling of quietness and coolness in themselves by actively contracting and loosening specific muscle groups [19].

2.3 Quality Appraisal

The quality of each study included in this review was assessed by a trustworthy assessment tool, the Cochrane Risk of Bias instrument, as shown in Table 1.

Table 1 Cochrane Risk of Bias tool of risk of bias for reviewed studies in Systematic Review [27].

	Dehkordi & Jalali., [19]	Mahmoodi et al., [28]	Hameed et al., [29]	Fayazi et al., [30]	Chaudhuri et al., [31]	Rad et al., [32]	Khuntia &Thakur [33]
Randomization bias							
1 = High	√	√	√	√	√	√	√
2 = Some concern							
3 = Low							
NA: Not Applicable							
Intended intervention							
1 = High	√	√	√	√	√	√	√
2 = Some concern							

3 = Low							
NA: Not Applicable							
Withdrawal and dropout							
1 = High				√			
2 = Some concern							
3 = Low							
NA: Not Applicable	√	√	√		√	√	√
Blinding							
1 = High							
2 = Some concern							
3 = Low				√			
NA: Not Applicable	√	√	√		√	√	√
Outcome measurement							
1 = High	√	√	√	√	√	√	√
2 = Some concern							
3 = Low							
NA: Not Applicable							
Selection of reported results							
1 = High	√	√	√	√	√	√	√
2 = Some concern							
3 = Low							
NA: Not Applicable							

Cochrane tool risk of bias in randomized control trials in the systemic review (RoB 2) was used to assess the risk of bias in this review based on six domains: 1) Bias due to the randomization method, 2) Bias from variations in intended interventions, 3) Bias due to withdrawal and dropout, 4) Bias due to blinding, 5) Bias in outcome measurement, 6) Bias due to the selection of the reported results. Judgment in the risk of bias was divided into four levels for each domain (1 = High, 2 = Some concern, 3 = Low, 4 = Not Applicable). Table 2 describes the Cochrane risk-of-bias tool for randomized trial domains.

Table 2 *Cochrane risk-of-bias tool for randomized trials domains.

Domain	Domain Description

Bias due to the randomization method	Whether the distribution was random, hidden sequence distribution, or the variations between intervention groups due to error in the randomization process.
Bias from variations in intended interventions	Do participants or care providers know about the applied intervention in the trial?
Bias due to withdrawal and dropout	If participants withdraw and drop out during the trial, make variations in the results.
Bias due to blinding	If the blinding was applied or not for both participations and evaluators.
Bias in outcome measurement	If the way of measuring outcomes was unsuitable or had variation between the intervention groups if evaluators know the intended intervention (if yes) was the outcome affected by their knowledge?
Bias due to the selection of the reported results	If the trial results were based on the actual result outcome or were based on pre-planned outcomes before the intended results.

[*]Higgins JPT, Savović J, Page MJ, Elbers RG, Sterne JAC. Chapter 8: Assessing risk of bias in a randomized trial. In: Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch VA (editors). Cochrane Handbook for Systematic Reviews of Interventions version 6.4 (updated August 2023). Cochrane, 2023.

Ethical approval was obtained from the ethical committees at the School of Nursing at the University of Jordan and the Ministry of Education (MOE).

To find out the risk of bias for the reviewed studies, researchers checked the risk of bias independently, and then a discussion followed to confirm the results to reach a total agreement. All studies were rated as low risk of randomization bias, interventions, outcomes, and results. Blinding did not apply to the reviewed studies since it was not clearly explained in the selected studies. On the other hand, withdrawal and dropout were not applicable in reviewed studies. Two reviewers evaluated the quality of each study independently (further details on data extraction were supported in the next section). Disagreements were solved through discussion and the inclusion of a third reviewer. The study was considered low quality if it scored 50% or less for all quality assessment items of each study design.

2.4 Data Extraction and Data Synthesis

Two reviewers extracted data from eligible studies to ensure consistency. As screening protocol for this review, two reviews independently reviewed Jonna Briggs Institute (JBI) Critical Appraisal assessment tools [34] to evaluate the reliability and trustworthiness of the included studies.

The assessment tool was a checklist to evaluate the RCT studies included in the review under the title "Revised Randomized Controlled Trial Checklist". The checklist presented a comprehensive, consistent method for assessing several parts of RCTs, including internal validity, all kinds of bias, statistical validity, randomization procedures, blinding, and attrition rates, among other critical variables [34].

The checklist investigates thirteen critical items for the systematic review. The checklist included four answers: Yes, no, Unclear, and Not Applicable [35]. Each checklist item scored 1 for the "Yes" answer and "Zero" for any other responses, reflecting poor response or non-significance to the

specific measure. The cut-off points are based on previous reports on the JBI critical appraisal assessment tool that classify research as low, moderate, or high quality, as the systematic reviewers themselves report the best selection [36]. Beyond the assessment standards, studies gaining 70% or more of the maximum acceptable scores were deemed as "high quality". In comparison, studies between 50% and 70% were categorized as "moderate quality" and scoring below 50% were classified as "poor quality". Furthermore, for the checklist, scoring ten points or more was categorized as "high quality", scoring between seven and ten points was classified as "moderate quality", and studies that got six points or less were characterized as "poor quality".

The studies scored between high and moderate quality were only included in the review from the reviewer's quality assessment point of view. Two reviewers independently evaluated the study's quality and reliability. Any possible disagreements between the reviewers were resolved by discussion. If no decision was accomplished, a third senior reviewer's opinion was taken to help in achieving a final decision. The comprehensive and accurate assessments confirmed that the included studies in the review met a high-quality methodology standard. Afterward, data extraction was done by two independent reviewers, and the results are presented in the next part.

A formalized form of data collection included the following data: the primary author, year of publication, country of study, study participants, study outcomes, intervention, and study results. Seven articles were included in this systematic review. A random model to account for sampling variation and expected heterogeneity in effect size across studies related to differences in PMRT application was utilized. The heterogeneity between the studies was assessed using the I2 test statistics and *P* values. The I2 statistic provides an estimate of the proportion of variability in a meta-analysis due to differences in a meta-analysis, rather than chance or sampling error. The I2 statistic is a percentage of variation across studies that is attributed to heterogeneity. It quantifies the extent to which the observed differences in a study's results can be attributed to true differences in the effects being studied, rather than random variation. The I2 statistic is calculated based on a comparison of the effects of individual studies and the pooled effect across studies. The weighted sum of squared differences between the particular study and pooled effects is then calculated, with the weights used in the pooling method. This sum is then used to estimate the proportion of variation due to heterogeneity (https://www.statsdirect.com/help/Default.htm#meta_analysis/heterogeneity.htm/accessed April 30, 2024). The heterogeneity was considered low, moderate, or high when the I2 test statistic results were 25%, 50%, and 75%, respectively.

3. Results

The preferred reporting items for systematic reviews and meta-analysis (PRISMA) statements were adapted to report this systematic review and meta-analysis [37]. The keywords that were identified for this purpose include "progressive muscle relaxation technique," "PMRT," "progressive muscle relaxation," "PMR," "acute myocardial infarction," "AMI," "coronary artery," "quality of life," "stress," and "anxiety." With these keywords, a comprehensive understanding of the benefits of PMRT among patients with AMI was provided in terms of improving their QoL and reducing stress and anxiety levels. To narrow down the results, advanced research filters were applied, such as publication date (within the last 10 years), language (English), and study type (clinical randomized trials, systematic reviews). Moreover, Clear inclusion and exclusion criteria are established to guide

the selection of studies. Inclusion criteria included studies involving patients with AMI, interventions utilizing PMR, and outcomes related to QoL, stress, or anxiety. Exclusion criteria encompassed studies with different interventions, irrelevant outcomes, other healthcare providers being responsible for measuring the outcomes (QOL, stress, and anxiety levels) rather than the registered nurses, or inadequate study designs. When study variables were combined, 1755 published articles were identified, retrieved, and reviewed. From those, 238 duplicated records were removed, and 167 articles were excluded by screening the title and abstracts due to irrelevance or not being written in English or within the specified timeframe. After that, 40 full-text papers were assessed for eligibility criteria. Seven full-text articles were excluded since the outcome of interest was not reported. Finally, seven studies were included in the final systematic review as shown in Figure 1.

Seven studies that met the inclusion criteria were summarized in a matrix, as shown in Table 3. The included studies used progressive muscle relaxation techniques as an intervention. Four studies examine the quality of life as an outcome, two present the anxiety level as an outcome, and one study assesses the stress level. Registered Nurses were responsible for measuring QOL, stress, and anxiety levels in all included studies.

Table 3 Summary of included studies (n = 7).

Primary Author & Year	Country	Sample Size	Subject	Demographics Information	Outcome Measured	Intervention	Results
Dehkordi & Jalali [19]	Shahrekord, Iran	80	Myocardial Infarction patients	The majority of the participants were female (60% of the intervention group and 56% of the control group). The mean age of participants in the intervention was 65 ± 3 years and 66 ± 4 years for the control groups. (Not mention the age range)	Quality of life Pain Fatigue	PMRT	Applying such intervention (PMRT) improves daily life activity which positively affects patients' quality of life.
Mahmoodi [28]	Iran	64	Myocardial Infarction patients	The majority of the participants were male (84.4%) with a mean age of 52.29 ± 8.19 years (age range: 37-77 years).	Quality of life	PMRT	Provide PMRT as a training program among MI patients.
Hameed [29]	Iraq	60	Myocardial Infarction patients	The majority of the participants were male (66.7%), with age range (41-45) years.	Stress	PMRT	PMRT is an effective intervention to reduce stress among cardiac patients.
Fayazi [30]	Saveh, Iran	70	Acute Coronary Syndrome Patients	Most of the control (89.9%) and intervention groups (85.8%) participants were female. The mean ages of the patients in the control and intervention groups were 54.61 ± 17.97 and 59.92 ± 18.36 years, respectively.	Quality of life	PMRT	Applying PMRT as an educational program for MI patients.
Chaudhuri [31]	India	40	Coronary artery	70% of the participants were male patients.	Anxiety level	PMRT	PMRT is a non-pharmacological

			disease patients	40%was in the age group of 52-61 years.	Depression level		intervention and one of the most effective nursing interventions that reduce anxiety levels and must add to the body of nursing knowledge and for daily nursing activities care.
Rad [32]	Qom, Iran	60	Coronary artery disease patients	Men comprised more than 65% of the participants in each group. The average age of intervention and control participants were 58.1 ± 5.8 and 57.66 ± 4.5, respectively.	Quality of life	PMRT	Performing PMRT after the health care provider's education enhances the quality of life and improves the duction role of both the medical team and patients.
Khuntia &Thakur [33]	India	46	Myocardial Infarction patients	The majority of the participants were female in the interventional group (n = 14, 60.8%), while an approximately equal number of males and females among the control group. 39.2% of the age for the interventional group ranged between 31-40 years, and 39.3 % of participants age among the control groups were below 30 years	Physical Indicators Anxiety level	PMRT	PMRT is an effective intervention to reduce levels of anxiety and improve patients' physical indicators based on blood pressure, pulse, and O2 saturation.

3.1 Study Characteristics

The total sample of study participants were (n = 420) cardiac patients who were represented in seven studies conducted in India, Iraq, and Iran. All studies provide descriptive statistics related to sex. The female patients were (n = 196, 46.6%), and the male was (n = 224, 53.3%). One of the studies was conducted in Iraq (n = 1, 14%), two studies in India (n = 2, 28%), and four studies in Iran (n = 4, 56%).

3.2 Outcomes

Progressive Muscle Relaxation Techniques is a promising intervention for improving various outcomes in patients with cardiovascular conditions, such as QoL, stress, anxiety, and physical indicators. Studies conducted in different countries, including Iran, Iraq, and India, have shown consistent positive effects associated with PMRT across diverse patient populations.

Seven clinical outcomes were evaluated in all seven studies; two studies assessed the anxiety outcome [31, 33]. One study investigated the Depression outcome [31]. One study examined the stress level [29]. Four studies assessed the quality of life as an outcome [19, 28, 30, 32]. One study investigated pain and fatigue as outcomes [19]. One study assessed physical indicators outcomes [33]. All outcomes were measured using a progressive muscle relaxation technique as an intervention.

The effect of using progressive muscle relaxation technique on quality of life was measured directly after the training session. The results were significant in all included studies [19] ($p < 0.05$), [28] ($p > 0.001$), [30] ($P = 0.01$) & [32] ($p > 0.05$). Besides, stress become a universal phenomenon among patients with cardiac diseases. In the current systematic review, it was found one study assessed the stress outcome [29] with a significant level of ($P = 0.001$). Additionally, two studies evaluated the anxiety outcome. The results showed as follows: [31] ($P = 0.001$) & [33] ($P < 0.005$).

The clinical implications of the PMRT could be integrated into cardiac rehabilitation programs as a non-pharmacological adjunctive therapy to enhance overall patient well-being and recovery. Healthcare providers, including nurses and rehabilitation specialists, can incorporate PMRT techniques into their practice to help patients manage stress, anxiety, and other psychosocial factors associated with cardiovascular disease. PMRT may be particularly useful in addressing the holistic needs of patients with cardiovascular conditions, including those experiencing pain, fatigue, and psychological distress. However, the limitations of the reported study results include small sample sizes, potential selection biases, and variations in study methodologies and outcome measures.

Most studies focus on short-term outcomes, limiting our understanding of the long-term effects of PMRT on cardiovascular health and QoL. Demographic differences across study populations, such as age and sex distribution, may impact the generalizability of the findings and warrant further investigation. Some studies lack control groups or utilize non-randomized designs, which could introduce confounding variables and limit the ability to establish causal relationships between PMRT and observed outcomes. Future research should prioritize more extensive, well-controlled studies with more extended follow-up periods to clarify the persistent effects of PMRT on cardiovascular outcomes and QoL. Comparative effectiveness studies could help determine the relative efficiency of PMRT compared to other interventions or standard care protocols.

Conducting subgroup analyses is a valuable way for researchers to understand better the factors that influence the effectiveness of PMRT. By doing so, they can improve the reliability and applicability of their findings to different patient populations and clinical settings. Subgroup analyses can be categorized into demographic factors and clinical Characteristics.

- Subgroup analyses by Demographic Factors:
  1. Age: Researchers can explore whether the impact of PMRT differs across different age groups (e.g., younger vs. older participants).
  2. Sex: It is possible to assess the differences in response to PMRT between genders.
  3. Comorbidities: Researchers can examine whether patients with specific comorbidities (e.g., diabetes, hypertension) or relevant clinical characteristics benefit differently from PMRT.
- Subgroup analyses by Clinical Characteristics:
  1. The severity of the disease: Researchers can examine differences in the efficacy of PMRT among patients with differing degrees of disease severity (e.g., mild vs. severe myocardial infarction).
  2. Duration for Diagnosis: It is possible to assess whether the timing of PMRT initiation post-diagnosis affects its effectiveness.
  3. Medication Usage: Researchers can investigate whether current medication use influences the outcomes of PMRT.

4. Discussion

Myocardial infarction is an acute, progressive disease in which part of the heart muscle is damaged or dead due to decreased blood flow and oxygen to heart cells [6], in which the heart cannot meet its required demands [7].

4.1 Myocardial Infarction (MI) Epidemiological Data

1. **Prevalence and Burden**:
   - MI is a significant worldwide burden, and it has been mentioned as an emerging situation for more than 25 years. Accountable for numerous deaths and disabilities globally and detrimentally affects patients' QoL [6].
   - The Middle East has a higher prevalence of MI (10.1%) compared to the global average (3.8%) [15].
   - The current prevalence of MI is approximately 194 (22,200 per 100000 inhabitants) million cases globally, with an increasing trend over time [38].
   - The average age for the first MI attack is 65 years for men and 72 years for women [38].
2. **Hospital Admissions and Readmission**:
   - MI is the main reason for hospital admissions globally [9].
   - Approximately 20% (1 in 5 patients) of patients with MI are readmitted within 30 days post-discharge [39].
3. **Frequency and Financial Impact**:
   - MI occurs approximately every 40 seconds [11].
   - The global financial healthcare cost for MI patients is about $18,953 annually [34].
4. **Risk Factors**:

- Common risk factors for MI include hypertension (45.6%), obesity (39.6%), smoking (15.5%), chronic kidney disease (14.8%), and diabetes mellitus (9.8%) [40].
- Lifestyle factors and age contribute to the risk of MI, with the incidence among younger age groups increasing [12].
- Differences in lifestyles, socioeconomic conditions, and urban-rural disparities contribute to heterogeneity in MI prevalence across regions [13].

5. **Geographic Variance**:
   - Variability in MI prevalence across Arab countries and within countries can be attributed to differences in lifestyle, socioeconomic conditions, and urban-rural disparities [13].

This paper presents a systematic review of the effectiveness of Progressive Muscle Relaxation Techniques (PMRT) in Myocardial Infarction for stress, anxiety, and quality of life. Our review identified seven studies from three (3) countries, covering 420 total samples. This review is a pioneering effort in that it systematically builds up reporting the outcomes related to the effectiveness of PMRT among MI patients, thus contributing to the current body of knowledge. Furthermore, this review is outstanding for its comprehensive approach, presenting studies utilizing Randomized Controlled Trial (RCT) research designs. Accordingly, it presents a systematic view of the various methods used to assess the effectiveness of PMRT. This comprehensive review not only increases the reviewed evidence but also provides for the analysis of the different study designs, resulting in a deeper understanding of PMRT's plausible outcome.

The way of presenting this review supports a visible knowledge of PMRT's effectiveness in numerous therapeutic circumstances by providing evidence from intervention. Based on the outcomes, PMRT has generally been applied to reduce stress and anxiety and improve the quality of life in cardiac patients. One out of seven studies supports PMRT's effectiveness in reducing stress, two studies on reducing anxiety, and four on improving quality of life.

The majority of the review trends that occur when applying Progressive Muscle Relaxation Technique (PMRT) exercise show efficacy in reducing stress anxiety and improving quality of life in cardiac patients, especially patients with MI. Our review found that when patients applied PMRT exercises on their own in private places, the outcome measures were enhanced. Variations in exercise length did not significantly affect the outcomes. Our study proved that there was an extensive trend of decreasing mental health outcomes over time and improving quality of life. Furthermore, our results show that consistency, whether daily or only every other day, does not significantly impact the outcomes and even the frequency of PMRT sessions. The overall trend of studies presented reduced outcome measures (stress and anxiety) and improved quality of life.

Stress and anxiety affect the quality of life, so to prevent the negative impact of stress and anxiety and enhance the quality of life in MI patients, the progressive muscle relaxation technique is one of the non-pharmacological interventions that can be used to reduce anxiety and stress level and improve quality of life.

Most participants included in the review were male patients with MI who received the same intervention (PMRT) despite differences in the graphical areas between the included studies except in two studies, one conducted in Iran and the other in India, which is not constantly approved with population characteristics in these areas. Demographic data does not affect the patient's outcomes as presented in Table 2. The heterogeneity in the studies was based on the length of the intervention, which was positively associated with patient outcomes. On the other hand, a combination of more

than one relaxation technique can enhance patient outcomes compared to applying only one exercise.

A study performed by Emelia J Benjamin. [41] reported that around one million people in middle age have poorer physical and higher risk factors for CVDs, such as smoking, poor physical activity, and obesity. Implementing the PMRT has positive clinical outcomes on patients' lives as reduced readmission rates and length of patient hospitalization. Moreover, the implementation of the PMRT among patients with MI reduced the need for invasive producers (e.g., intubation), medications such as inotropes, medical costs, mortality rate, decreased levels of stress and anxiety, and improved the patient's quality of life. Furthermore, international health agencies such as the World Health Organization work hard to reduce morbidity and mortality rates, improve patients' quality of life, and establish standards of care, such as creating PMRT to prevent complications and risks of MI over time.

This review provides an examination of the effects of muscle relaxation techniques on the quality of life, stress, and anxiety levels among MI patients compared to conventional care. In total, seven randomized controlled trials were included in this systematic review. The results showed that the muscle relaxation technique significantly reduced the level of stress and level of anxiety among MI patients and thus improved their QoL compared with conventional care.

The advancement of using PMRT reflects that 70% of MI patients suffer from stress and anxiety, which directly affect their QoL. It is necessary to pay attention to finding a method to decrease stress and anxiety levels and enhance quality of life rather than relying on pharmacologic therapy. Accordingly, we used stress, anxiety, and QoL as the outcome measures in this systematic review to examine the effect of progressive muscle relaxation techniques on patients' QoL, stress, and anxiety levels.

Several studies reviewed the effects of PMRT as a crucial non-pharmacological intervention for patients with several chronic diseases but not yet for MI patients. The results of this review will address the impacts of PMRT quality of life, stress, and anxiety levels among patients with MI in Jordan. Many studies show a positive therapeutic effect of PMRT on reducing stress, anxiety, and quality of life [19, 37]. This technique has not been used as a rehabilitation therapy among MI patients who are suffering from severe adverse effects of stress and anxiety on their QoL. Despite that, MI patients do not practice the PMRT yet because there is a lack of evidence on the effects of this maneuver in the healthcare systems.

In a study that was performed by Dehkordi & Jalali., 2016 [19], a pre-posttest design was used to measure the QoL for patients who experience MI, in which they found no differences between the two groups (P= 0.27) ($P < 0.05$). It was stated that the progressive muscle relaxation technique is more effective and statistically significant regarding the quality of life ($P < 0.05$). Another study was conducted by Mahmoodi et al., 2018 [28] in Iran to assess whether the patient's QoL outcome was statistically significant between the pre-posttest groups ($P < 0.001$) after the application of the progressive muscle relaxation technique.

Similarly, a study was performed by Fayazi et al., 2020 [30] to evaluate the effectiveness of using a progressive muscle relaxation technique on QoL, which showed a statistically significant result in the interventional group ($P = 0.01$). One study examined stress as an outcome by applying the progressive muscle relaxation technique, which was statically significant (P=0.00) in the interventional group [29]. Results proved parallel indications for anxiety outcomes in a study that was conducted by Chaudhuri et al., 2020 [31] in which a pre-posttest was applied. It was reported

that the pretest was not statistically significant between the control and interventional group (P = 0.414). At the same time, the post-test was statistically significant in the group trained with PMRT *(P* = 0.001) after the training sessions (P = 0.001).

However, this review had some limitations. Firstly, a lack of studies that applied the PMRT among MI patients in Arab countries could introduce a bias in the regional areas. Another significant restriction concerns the differences in guidelines retained across the included studies.

4.2 Clinical Implication

Myocardial Infarction is widely spread among undeveloped countries since they share the culture, environment, and lifestyles [42]. There is a lack of studies in most Arab regions, such as Jordan, Sudan, Somalia, Libya, Yemen, Qatar, Morocco, and Syria. Governments, policymakers, and international organizations must strengthen the collaborations to address MI globally and start programs to help manage the complications, such as applying non-pharmacological treatment. Local governments and policymakers must ponder power regulations to address such interventions associated with MI patients and improve public awareness about educational programs and training related to self-care and managing MI effectively. Collaboration between nurse- and patient-targeted educational interventions could also help enhance the QoL and reduce the incidence of new events. Standardizing the strategies and guidelines used to measure the effectiveness of PMRT among cardiac patients is crucial. Researchers from other countries in the Arab world should powerfully consider implementing related interventions or collaborating regionally to enhance results that may facilitate building evidence-based solid practice.

According to data from the reviewed articles, clinical skills advancements among healthcare teams, such as physicians and nurses, are needed to enhance human resources to provide training to improve the QoL and decrease stress and anxiety levels among MI patients. Nurses must contribute dynamically to an interprofessional team as leaders, educators, and coordinators. Nurses are the best-qualified healthcare professionals closest to patients and could help change patients' behaviors toward a healthy lifestyle.

This study may be a stone for further research to assess the effectiveness of progressive muscle relaxation techniques over a long period and how they affect MI symptoms compared with other diseases. In summary, this study has important clinical significance. It emphasizes the importance of a more systematic screening of MI patients' anxiety, stress, and QoL. It also underscores the need for muscle relaxation training in MI care to improve patients' QOL and decrease stress and anxiety levels. Moreover, Future research may also evaluate the existing review's results by integrating a more targeted population, such as focusing PMRT interventions among the wider population rather than patients, which may power our knowledge of PMRT's possible advantages and suitable implementation in different conditions.

In summary, this study has important clinical significance. It emphasizes the importance of a more systematic screening of MI patients' anxiety, stress, and QoL. It also underscores the necessity for using muscle relaxation training in MI care to improve patients' QOL and decrease stress and anxiety levels.

5. Conclusion

This review provides strong evidence for utilizing progressive muscle relaxation techniques to improve clinical outcomes among MI patients. Nonetheless, there are several important reasons why this review was conducted, including the number of available studies, their overall quality, and their exploratory nature. To validate the findings, it is advised that the existing primary research be evaluated regularly. Sadly, it was not possible to evaluate the progressive muscle relaxation technique's efficacy because there were no follow-up investigations. To enable healthcare practitioners to evaluate the efficacy of PMRT's long-term effects on patients' clinical outcomes and encourage the use of non-pharmacological treatment rather than medication, more research is required to enhance the long-term assessment of PMRT. Furthermore, much evidence provides the effectiveness of using PMRT in reducing stress and anxiety in addition to improving quality of life.

Acknowledgments

Author Contributions

Conceptualization, A.A.; methodology, M.S.; formal analysis, A.A.; investigation, A.A; data curation, A.E.; writing—original draft preparation, A.A.; writing—review and editing, visualization, A.A.; supervision, A.A.; project administration, A.A. All authors have read and agreed to the published version of the manuscript.

Competing Interests

The authors report there are no competing interests to declare.

References

1. World Health Organization. 6 ways to take care of your mental health and well-being this World Mental Health Day. World Health Organization; 2011.
2. World Health Organization (WHO). 2020 Global Reference List of 100 Core Health Indicators. World Health Organization; 2020.
3. Araya-Ramírez F, Briggs KK, Bishop SR, Miller CE, Moncada-Jiménez J, Grandjean PW. Who is likely to benefit from phase II cardiac rehabilitation? J Cardiopulm Rehabil Prev. 2010; 30: 93-100.
4. Shuaib K, Ismail GM, Fouad N. Effect of educational program on compliance of myocardial infarction (MI) patients in Gaza strip. J Educ Pract. 2014; 5: 5-14.
5. Hani SB, Ahmad M. Effective prediction of mortality by heart disease among women in Jordan using the Chi-Squared automatic interaction detection model: Retrospective validation study. JMIR Cardio. 2023; 7: e48795.
6. Reed GW, Rossi JE, Cannon CP. Acute myocardial infarction. Lancet. 2017; 389: 197-210.
7. Sandoval Y, Thygesen K, Jaffe AS. The universal definition of myocardial infarction: Present and future. Circulation. 2020; 141: 1434-1436.

8. Salari N, Morddarvanjoghi F, Abdolmaleki A, Rasoulpoor S, Khaleghi AA, Hezarkhani LA, et al. The global prevalence of myocardial infarction: A systematic review and meta-analysis. BMC Cardiovasc Disord. 2023; 23: 206.

9. Hani SHB, Ahmad MM. Machine-learning algorithms for ischemic heart disease prediction: A systematic review. Curr Cardiol Rev. 2023; 19: e090622205797.

10. Philbois SV, Facioli TP, Gastaldi AC, Rodrigues JA, Tank J, Fares TH, et al. Important differences between hypertensive middle-aged women and men in cardiovascular autonomic control—a critical appraisal. Biol Sex Differ. 2021; 12: 11.

11. Harrington DH, Stueben F, Lenahan CM. ST-elevation myocardial infarction and non-ST-elevation myocardial infarction: Medical and surgical interventions. Crit Care Nurs Clin North Am. 2019; 31: 49-64.

12. Hayeah HM, Saifan AR, AbuRuz ME, Aljabery MA. Health-related quality of life in heart failure in Jordan from patient's perspectives. IOSR J Nurs Heal Sci. 2017; 6: 14-21.

13. Neufcourt L, Deguen S, Bayat S, Paillard F, Zins M, Grimaud O. Geographical variations in the prevalence of hypertension in France: Cross-sectional analysis of the CONSTANCES cohort. Eur J Prev Cardiol. 2019; 26: 1242-1251.

14. Fazia T, Bubbico F, Nova A, Buizza C, Cela H, Iozzi D, et al. Improving stress management, anxiety, and mental well-being in medical students through an online mindfulness-based intervention: A randomized study. Sci Rep. 2023; 13: 8214.

15. Demiralp M, Oflaz F, Komurcu S. Effects of relaxation training on sleep quality and fatigue in patients with breast cancer undergoing adjuvant chemotherapy. J Clin Nurs. 2010; 19: 1073-1083.

16. Saeedi M, Ashktorab T, Saatchi K, Zayeri F, Amir Ali Akbari S. The effect of progressive muscle relaxation on sleep quality of patients undergoing hemodialysis. Iran J Crit Care Nurs. 2012; 5: 23-28.

17. Dayapoğlu N, Tan M. Evaluation of the effect of progressive relaxation exercises on fatigue and sleep quality in patients with multiple sclerosis. J Altern Complement Med. 2012; 18: 983-987.

18. Pathak P, Mahal R, Kohli A, Nimbran V. Progressive muscle relaxation: An adjuvant therapy for reducing pain and fatigue among hospitalized cancer patients receiving radiotherapy. Int J Adv Nurs Stud. 2013; 2: 58-65.

19. Hassanpour-Dehkordi A, Jalali A. Effect of progressive muscle relaxation on the fatigue and quality of life among Iranian aging persons. Acta Med Iran. 2016; 54: 430-436.

20. Torales J, O'Higgins M, Barrios I, González I, Almirón M. An overview of Jacobson's progressive muscle relaxation in managing anxiety. Rev Argent Clin Psicol. 2020; 29: 17-23.

21. Gangadharan MP, Madani MAH. Effectiveness of progressive muscle relaxation techniques on depression, anxiety and stress among undergraduate nursing students. Int J Health Sci Res. 2018; 8: 155-163.

22. Tan L, Fang P, Cui J, Yu H, Yu L. Effects of progressive muscle relaxation on health-related outcomes in cancer patients: A systematic review and meta-analysis of randomized controlled trials. Complement Ther Clin Pract. 2022; 49: 101676.

23. The World Bank. Arab world [Internet]. Washington, D.C.: The World Bank; 2014. Available from: https://data.worldbank.org/region/arab-world.

24. Rahim HFA, Sibai A, Khader Y, Hwalla N, Fadhil I, Alsiyabi H, et al. Non-communicable diseases in the Arab world. Lancet. 2014; 383: 356-367.

25. Bonita R, Magnusson R, Bovet P, Zhao D, Malta DC, Geneau R, et al. Country actions to meet UN commitments on non-communicable diseases: A stepwise approach. Lancet. 2013; 381: 575-584.

26. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. PLoS Med. 2009; 6: e1000097.

27. Whiting P, Savović J, Higgins JP, Caldwell DM, Reeves BC, Shea B, et al. ROBIS: A new tool to assess risk of bias in systematic reviews was developed. J Clin Epidemiol. 2016; 69: 225-234.

28. Mahmoodi M, Mahmoodi-Shan GR, Kamkar MZ, Behnampour N, Dabirian M. Impact of relaxation training and exercise on quality of life in post-myocardial infarction patients: A randomized clinical trial. Evidence Based Care. 2018; 8: 75-80.

29. Hameed DM, Aldakheel AHA, Razak S. Assessment of the effect of muscle relaxation technique on stress of patient with coronary artery disease. Res J Pharm Biol Chem Sci. 2018; 9: 1698-1706.

30. Fayazi N, Naseri Salahshour V, Karimy M, Fayazi H. An educational intervention to improve quality of life: A single-blind randomized controlled trial on the quality of life in patients with acute coronary syndrome. J Vessels Circ. 2020; 1: 21-26.

31. Chaudhuri A, Manna M, Mandal K, Pattanayak K. Is there any effect of progressive muscle relaxation exercise on anxiety and depression of the patient with coronary artery disease. Int J Pharma Res Health Sci. 2020; 8: 3231-3236.

32. Rad MG, Ghanbari-Afra L, Hoseini MHM, Afra MG, Asayesh H. Effectiveness of self-care program on the quality of life in patients with coronary artery disease undergoing cardiac rehabilitation: A Randomized clinical trial. J Educ Health Promot. 2021; 10: 375.

33. Khuntia SK, Thakur R. The effect of progressive muscle relaxation technique on physical parameters and anxiety among patients with myocardial infarction. Int J Clin Biochem Res. 2023; 10: 37-49.

34. Barker TH, Stone JC, Sears K, Klugar M, Leonardi-Bee J, Tufanaru C, et al. Revising the JBI quantitative critical appraisal tools to improve their applicability: An overview of methods and the development process. JBI Evid Synth. 2023; 21: 478-493.

35. JBI. Critical appraisal tools [Internet]. Adelaide, Australia: JBI, Faculty of Health and Medical Sciences, The University of Adelaide; 2023. Available from: `https://jbi.global/critical-appraisal-tools`.

36. Munn Z, Barker TH, Moola S, Tufanaru C, Stern C, McArthur A, et al. Methodological quality of case series studies: An introduction to the JBI critical appraisal tool. JBI Evid Synth. 2020; 18: 2127-2133.

37. Khazaei Ghozhdi M, Ghaljeh M, Khazaei N. The effect of progressive muscle relaxation technique on fatigue, pain and quality of life in dialysis patients: A clinical trial study. Evidence Based Care. 2023; 12: 7-16.

38. Khan E, Brieger D, Amerena J, Atherton JJ, Chew DP, Farshid A, et al. Differences in management and outcomes for men and women with ST-elevation myocardial infarction. Med J Aust. 2018; 209: 118-123.

39. Wang H, Zhao T, Wei X, Lu H, Lin X. The prevalence of 30-day readmission after acute myocardial infarction: A systematic review and meta-analysis. Clin Cardiol. 2019; 42: 889-898.

40. Virani SS, Alonso A, Aparicio HJ, Benjamin EJ, Bittencourt MS, Callaway CW, et al. Heart disease and stroke statistics-2021 update: A report from the American Heart Association. Circulation. 2021; 143: e254-e743.

41. Benjamin EJ, Virani SS, Callaway CW, Chamberlain AM, Chang AR, Cheng S, et al. Heart disease and stroke statistics—2018 update: A report from the American Heart Association. Circulation. 2018; 137: e67-e492.

42. Alhabib KF, Gamra H, Almahmeed W, Hammoudeh A, Benkheddah S, Al Jarallah M, et al. Acute myocardial infarction and acute heart failure in the Middle East and North Africa: Study design and pilot phase study results from the PEACE MENA registry. PLoS One. 2020; 15: e0236292.