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Effectiveness of progressive muscle relaxation on anxiety in community-dwelling older adults in Indonesia

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Abstract

Community-dwelling older adults are a vulnerable group frequently affected by anxiety, which may impair their health, functioning, and quality of life. Progressive Muscle Relaxation (PMR) is a therapeutic method designed to induce relaxation and potentially reduce anxiety. This quasi-experimental study investigated the effect of PMR on anxiety levels among older adults in Pangkalpinang City, Indonesia, conducted from April to May 2020. A total of 138 participants were assigned to intervention (n=67) and non-intervention (n=71) groups. The intervention consisted of ten PMR sessions over five weeks, delivered twice weekly in small groups. Data were collected using the Geriatric Anxiety Inventory and analyzed via Wilcoxon and Mann-Whitney tests. The intervention group exhibited a significant reduction in anxiety from pre-test to post-test ($p = 0.0001$, $p < 0.005$), whereas the non-intervention group showed no meaningful change. The between-group comparison indicated a moderate effect ($p = 0.0001$, $p < 0.005$). PMR demonstrates beneficial outcomes in reducing anxiety among older adults; however, its implementation should involve trained health professionals and take into account individual conditions.

Introduction

Globally, approximately 4.4% of the population is affected by anxiety disorders. In 2021, an estimated 359 million people worldwide were living with anxiety disorders, underscoring its status as one of the most prevalent mental health conditions globally.¹ Anxiety often remains underrecognized by healthcare professionals, and societal stigma further hinders appropriate diagnosis and treatment. Among various mental health conditions, anxiety is widespread in the older adult population.²

In Indonesia, anxiety is classified as an emotional mental disorder. In the Bangka Belitung Islands Province, 11% of the population (3,884 individuals) reported experiencing emotional-mental disorders, exceeding the national average of 9.8%.³ The province's aging population structure may contribute to the increased prevalence of anxiety. Several factors underlie anxiety among older adults, including financial insecurity, health-related issues, and reduced social interaction due to bereavement or relocation.⁴ Loneliness also poses a significant risk factor, and older adults living with family are reportedly three times more likely to experience anxiety than those living alone.^{5,6}

Anxiety in older adults may result in social withdrawal, resistance to support, caregiver burden, and elevated suicide risk.⁷ If left untreated, anxiety can progress to depression, substance abuse, and physical health complications.⁸ Therefore, early intervention is essential.

Progressive Muscle Relaxation (PMR) is an effective non-pharmacological technique for reducing anxiety⁹. Unlike some therapies, PMR is accessible, can be performed independently, and serves both preventive and curative purposes. In addition, PMR is associated with minimal adverse effects.¹⁰ Progressive Muscle Relaxation (PMR) has also been shown to be effective in reducing anxiety across a broad range of conditions and populations.¹⁰⁻¹²

Although several studies have documented the benefits of PMR among individuals with cancer, heart disease, and other chronic illnesses,^{13,14} empirical evidence regarding its effectiveness in community-dwelling older adults remains limited. Furthermore, PMR interventions are often implemented on an individual basis rather than in group formats, leaving a gap in understanding their effectiveness when delivered in group settings.

Therefore, this study aimed to examine the effect of PMR on anxiety levels among community-dwelling older adults. This study offers a novel contribution by evaluating group-based PMR specifically among community-dwelling older adults, a population and delivery format that have been largely underexplored in previous research.

Materials and Methods

Ethical consideration

This study received ethical approval from the Nursing Ethics Committee of the Faculty of Nursing, Universitas Indonesia, under reference number SK-121-UN2.F12.D1.2.1/ETIK 2020.

Study design and setting

A quasi-experimental design was employed, utilizing a pre-test and post-test approach with a non-intervention group. The target population consisted of older adults residing in Pangkalpinang City, Indonesia. Data collection was carried out in sub-districts with the highest concentrations of older adults, including Rangkui District (Melintang, Asam, Keramat, Pintu Air, Mesjid Jamik, Parit Lalang, and Gajah Mada Urban Villages) and Gerunggang District (Tuatunu, Bukit Merapin, Taman Bunga, Bukit Sari, Kacang Pedang, and Air Kepala 7). The study was conducted between April and May 2020.

Sample size and sampling technique

The study population consisted of community-dwelling older adults in Pangkalpinang City, totaling 39,413 individuals in 2020. The sample size was determined using a hypothesis-testing formula for the difference between two paired group means, which yielded a minimum requirement of 36 participants per group. To reduce the potential impact of intervention-related bias and to ensure adequate statistical power, this number was doubled, resulting in a target of 72 participants for both the intervention and non-intervention groups. Thus, the planned total sample size was 144 respondents. During data collection, five participants in the intervention group and one participant in the non-intervention group

withdrew from the study. The sampling process employed both probability sampling (stratified random sampling) and non-probability proportional sampling. Inclusion criteria were older adults who exhibited symptoms of anxiety and were able to communicate effectively. In contrast, exclusion criteria included individuals with extremity fractures, a history of heart disease, or other serious medical conditions.

Data collection tools and procedures

Data were collected at two time points: before the intervention and one week after its completion. The research procedure was divided into three stages.

Step 1 (preparation stage)

Three research assistants, all certified nurses, were recruited to assist in data collection and implementation of the PMR intervention. The principal investigator provided standardized training, including an explanation of the research protocol, guidance on administering the Geriatric Anxiety Inventory (GAI), and practice sessions for PMR techniques. The GAI instrument was validated with 30 respondents, and the Cohen's Kappa test was used to assess inter-rater consistency, yielding a perfect agreement score of 1.00 ($p = 0.000$). Potential participants were screened based on inclusion and exclusion criteria with assistance from local health cadres. Screening took place during the Integrated Health Post for Older Adults and senior citizen gatherings in village halls. Eligible participants received detailed study information and signed informed consent. Initially, interventions were planned in groups of 10–15; however, due to COVID-19, sessions were adjusted to smaller groups of 2–5 participants following public health guidelines. Interventions were conducted in participants' homes, agreed upon in advance.

Step 2 (implementation stage)

A carpet was prepared for participants to sit on during the intervention. Blood pressure was measured before each session, and if it exceeded 180/140 mmHg, the session was postponed. Researchers demonstrated the PMR sequence—including abdominal, thigh, and leg muscle groups—while participants followed. Each movement was repeated twice, counted from 1 to

7. Sessions lasted 30–35 minutes and were conducted twice weekly over five weeks (10 sessions total). One week after the final session, post-intervention anxiety levels were measured. To ensure ethical fairness, participants in the non-intervention group were also provided the PMR intervention in video format after the study, due to the increasing spread of COVID-19.

Step 3 (evaluation stage)

Participants in the intervention group were interviewed regarding their experiences. Some reported difficulty performing certain movements, such as facial (cheeks, nose, eyes) and thigh exercises, due to limited physical support. Others reported decreased tension in the neck and shoulder muscles. Movements involving the chest, shoulders, and upper back were noted to improve breathing comfort.

Instruments

Anxiety levels among participants were measured using the Geriatric Anxiety Inventory (GAI). The Geriatric Anxiety Inventory (GAI) has undergone prior validation across multiple study settings. Evidence from these evaluations indicates that the instrument exhibits robust psychometric properties. Specifically, it demonstrates a sensitivity of 0.89 (95% CI: 0.70–0.97) and a specificity of 0.80 (95% CI: 0.67–0.89).^{15,16}

In this study, the researcher conducted an additional validity and reliability assessment using a sample of 30 older adults residing in Pangkal Balam District, Pangkalpinang City chosen due to their demographic similarity to the target population. The initial validity test revealed four GAI items with low correlation values: item 2 ($r = 0.341$), item 12 ($r = 0.285$), item 14 ($r = 0.073$), and item 18 ($r = 0.059$). Despite these results, the researcher retained the items, considering that the GAI is a globally standardized tool and the lack of variation might be due to similar response patterns among the pilot participants.

A second validity test was conducted on the actual sample of 144 respondents. At a 5% significance level, all items showed a correlation coefficient (r) greater than the critical r -value of 0.159, indicating acceptable validity. The reliability test produced a Cronbach's

alpha of 0.777, confirming that the GAI is a valid and reliable instrument for assessing anxiety in older adults.

Data analysis

In this study, data were not normally distributed. Homogeneity was assessed using Levene's test. The Wilcoxon signed-rank test was applied to compare anxiety levels within each group. Additionally, the Mann-Whitney U test was employed to analyze differences in anxiety levels between groups.

Result

Respondent characteristics

The distribution of respondent characteristics is presented in Table 1. In the intervention group, the median age was 66 years, with the majority being female (91%) and having completed elementary or junior high school education (83.6%). Most respondents had a history of hypertension (73.14%), a history of smoking (active or passive, 74.6%), were widowed (62.7%), and were unemployed (70.1%). In the non-intervention group, the median age was 65 years, with most respondents being female (81.7%) and having elementary or junior high school education (74.6%). Additionally, a majority had a history of hypertension (56.3%), a history of smoking (active or passive, 53.5%), were widowed (49.3%), and were unemployed (83.1%). The median anxiety level was identical in both the PMR and non-intervention groups, with a value of 6.00.

In the intervention group, anxiety levels significantly decreased. The median anxiety score dropped from 6.00 in the pre-test to 1.00 in the post-test. In contrast, the non-intervention group showed no change, with the median anxiety score remaining at 6.00 in both pre- and post-tests, indicating no reduction in anxiety. The standard deviation in the intervention group decreased by 0.016 between the pre- and post-tests, reflecting reduced anxiety variability. At a 95% confidence interval, post-test anxiety levels ranged from 4.44 to 6.35, which were significantly lower than pre-test levels. However, no change was observed in the median anxiety score within the non-intervention group.

The Wilcoxon test indicated a statistically significant reduction in anxiety levels in the intervention group ($p = 0.0001$, $p < 0.005$). Conversely, the non-intervention group exhibited

no statistically significant change in anxiety levels ($p = 0.062$, $p > 0.005$). The Mann-Whitney U test demonstrated a significant effect of PMR on anxiety levels when comparing the intervention and non-intervention groups ($p = 0.0001$, $p < 0.005$).

Discussion

Progressive Muscle Relaxation involves systematic tensing and relaxing of muscle groups, eliciting distinct bodily sensations.¹⁷ This technique integrates physical and mental processes by alleviating muscle tension through focused attention. Although participants may initially feel discomfort during muscle tensioning, relaxation typically follows, producing calmness. Participants in this study reported similar experiences and progressively appreciated each movement. Older adults distinguished between tension and relaxation sensations, facilitating effective muscle relaxation.

Successful PMR implementation requires sustained focus.¹⁸ Researchers consistently guided participants through each movement to maintain engagement and ensure positive outcomes. However, some participants experienced difficulty recalling PMR movements, likely due to age-related cognitive decline affecting memory retention and therapeutic participation.⁴ To mitigate this, researchers provided direct guidance and PMR modules for home practice.

It is important for older adults to be aware of PMR indications and contraindications. The physical environment also influences PMR effectiveness; conducting sessions in open spaces may hinder concentration. This study took place in participants' homes, limiting control over the setting. Nonetheless, participants, unfamiliar with PMR, maintained focus and followed instructions well. Notably, individuals new to PMR tend to experience more pronounced anxiety reductions.

The findings of this study demonstrate that Progressive Muscle Relaxation (PMR) significantly reduces anxiety levels among community-dwelling older adults. Consistent with previous research, a substantial decline in anxiety was observed in the intervention group following the implementation of PMR.¹⁹ Likewise, a study conducted in China reported significant differences between pre- and post-intervention anxiety scores after the application of PMR.²⁰

This comparative analysis confirms that PMR effectively alleviates anxiety in older adults within community settings. These outcomes align with prior studies highlighting PMR's impact on anxiety reduction compared to non-intervention groups.²¹ Further evidence supports PMR's efficacy in improving mental health outcomes, including anxiety and depression reductions, which are essential for enhancing overall quality of life.¹³

One of the advantages of PMR over other interventions is its flexibility; it can be practiced whenever an individual experiences tension or anxiety, allowing it to serve as a preventive coping strategy.²² Furthermore, PMR can be performed in various postures, including sitting in a chair, lying down, or sitting cross-legged on the floor.^{23,24} In the present study, participants practiced PMR while seated on a carpeted floor. In situations that trigger anxiety or panic, PMR enables individuals to redirect their attention and mobilize internal coping resources.^{20,25} The simplicity and adaptability of PMR contributed to the smooth implementation of the intervention in this study, as no major difficulties or adverse events were encountered among the older adult participants. Therefore, PMR can be practically implemented in community nursing in Indonesia as a strategy to prevent psychosocial problems among older adults. These findings may inform community health programs and policymaking by supporting the integration of PMR into routine services for older adults within primary and long-term care frameworks.

A minimum of ten PMR sessions is recommended to achieve optimal therapeutic outcomes.²² In alignment with this recommendation, the present study implemented ten sessions over five weeks, with two sessions conducted each week. Studies involving burn patients have also reported reductions in anxiety and improvements in sleep quality following PMR interventions, even when delivered with lower session frequency.²⁶ A comparative study evaluating PMR, support group therapy, and a control group over five consecutive 45-minute weekly sessions demonstrated that mean happiness levels were significantly higher in the PMR group than in the other intervention conditions.²⁷ Overall, the evidence indicates that more frequent PMR sessions are associated with greater therapeutic benefits.²⁸ However, evidence from systematic reviews indicates that the duration of PMR training, whether delivered in shorter or longer formats, does not result in significantly different outcome measures.⁹

Across various studies, the integration of PMR with additional therapeutic components consistently produced greater anxiety reduction compared to PMR training administered in

isolation.^{14,29} In community-based interventions, physical exercise programs such as the Full-Body in-Bed Gym offer the potential to complement progressive muscle relaxation training by strengthening overall muscle function and helping to prevent sarcopenia among older adults with psychosocial problems.^{30,31} Its application for community-dwelling older adults could be incorporated into the Integrated Health Post for Older Adults, which prioritizes physical activity as a key strategy for improving quality of life in this population.

Conclusions

The intervention revealed significant differences in anxiety levels between pre-test and post-test measurements among respondents in the intervention group; however, no such differences were observed in the non-intervention group. These findings suggest that PMR effectively reduces anxiety among older adults living in community settings. Therefore, PMR should be considered a viable therapeutic approach for managing anxiety in community nursing care for older adults to minimize potential adverse effects.

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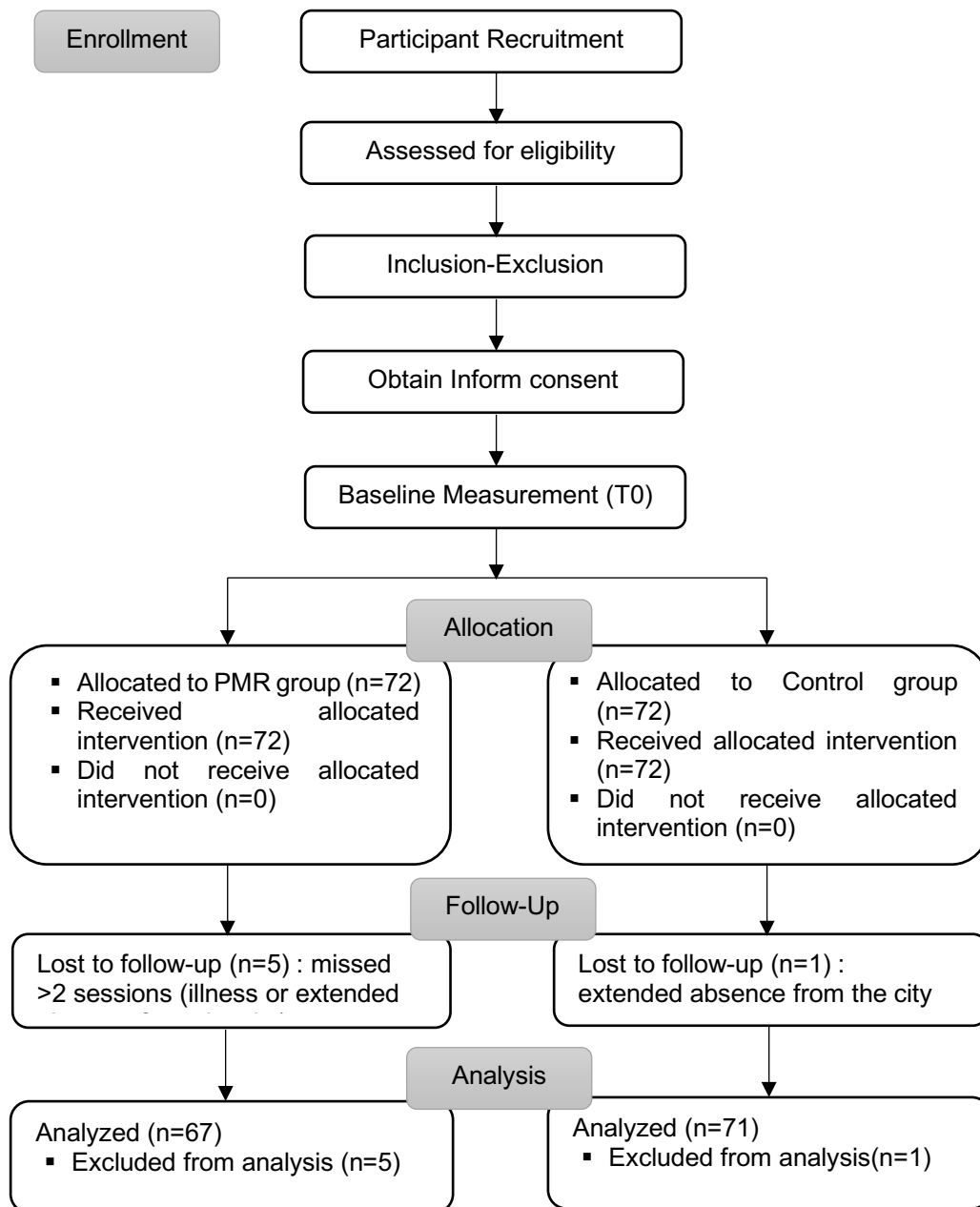


Figure 1. CONSORT flow diagram.

Table 1. Characteristics of community-dwelling older people.

Variable	Intervention Group	Non-Intervention Group	Levene test p-value
Age	66.00 (Median)	65.00 (Median)	0,0142
Sex			
Male	6 (9)	13 (18.3)	0,113
Female	61 (91)	58 (81.7)	
Education			
Senior High School	11 (16.4)	17 (23.9)	0,201
Elementary and Middle School	56 (83.6)	53 (74.6)	
No School	0 (0)	1 (1, 4)	
History of Hypertension			
No	18 (26.9)	31 (43.7)	0,040
Yes	49 (73.1)	40 (56.3)	
History of Smoking			
None	17 (25.4)	33 (46.5)	0,010
Yes	50 (74, 6)	38 (53,5)	
Marital Status			
Unmarried	1 (1,5)	0 (0)	0,135
Married	22 (32,8)	36 (50,7)	
Widower	2 (3)	0 (0)	
Widow	42 (62.7)	35 (49.3)	
Occupation			
Formal	1 (1.5)	1 (1.4)	0,100
Informal	19 (28.4)	11 (15.5)	
Not Working	47 (70.1)	59 (83.1)	
Anxiety	6.00 ± 3.739	6.00 ± 3.549	0,911

Table 2. Differences of anxiety level among community-dwelling older people in each group.

Variable	Group	Median ± SD	95% CI	<i>p</i>*	<i>p</i>**
Anxiety <i>Pre</i>	<i>Interventi on</i>	6.00 ± 3.739	6.16-7.99	0,0001	0,0001
Anxiety		1.00 ± 2.056	1.48-2.49		
<i>Post</i>					
Anxiety <i>Pre</i>	<i>Non-</i>	6.00 ± 3.549	5.08- 6.76		
Anxiety	<i>Interventi</i>	6.00 ± 3.565	4.44-6.35	0,062	
<i>Post</i>	<i>on</i>				

Wilcoxon Signed Rank Test*; *Mann-Whitney U*.