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The Effectiveness of the Progressive Muscle Relaxation Technique in Reducing Labor Pain During the First Stage of the Active Phase

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ABSTRACT

Background: In Indonesia, there are over 4 million births annually, with 7,503 occurring in Pesawaran District and 720 in Kedondong Public Health Center. A preliminary survey at Kedondong Public Health Center revealed that most women experienced moderate to severe pain (pain scale 5–8). Existing interventions such as breathing techniques, spousal support, and positive suggestions have not been optimally effective in reducing pain. Progressive muscle relaxation (PMR), a non-pharmacological technique combining deep breathing with alternating muscle contraction and relaxation, is believed to reduce pain transmission and improve oxygen flow.
Methods: This quantitative study used a quasi-experimental two-group pretest-posttest design. The population consisted of 51 laboring mothers at independent midwifery practices (PMB) in the Kedondong Health Center working area. A total of 32 participants were selected using accidental sampling and divided equally into intervention and control groups (16 each). Data were collected using observation sheets and analyzed using univariate and bivariate methods (Mann-Whitney test).
Results: The univariate analysis showed that the average pain score in the intervention group before the relaxation technique was 7.06 and decreased to 5.44 after the intervention. In the control group, the average pain score before was 6.63 and slightly decreased to 6.00. The results indicated that progressive muscle relaxation was effective in reducing labor pain (p-value = <0.001).
Conclusion: Progressive muscle relaxation is effective in reducing labor pain during the active phase of the first stage. Progressive muscle relaxation is applied as a non-pharmacological method to manage labor pain and increase maternal comfort and safety.

INTRODUCTION

Normal labor is a physiological process characterized by regular uterine contractions accompanied by cervical dilation and descent of the fetus, which is commonly associated with pain of varying intensity Labor pain is a universal experience among women and is often described as one of the most severe forms of pain. When labor pain is not adequately managed, it may lead to increased maternal anxiety, excessive stress responses, prolonged labor, and negative childbirth experiences. Therefore, effective and safe pain management during labor is a crucial component of quality maternity care, particularly in primary and midwifery-led care settings (Prawirohardjo, 2020).

Labor pain management can be achieved through pharmacological and non-pharmacological approaches. Although pharmacological methods such as analgesics and

anesthesia are effective, their use may be limited due to cost, availability, potential side effects, and clinical indications. Consequently, non-pharmacological methods, including breathing techniques, massage, relaxation, and guided imagery, have gained increasing attention (Ju, Ren, Chen, & Du, 2019). Progressive Muscle Relaxation (PMR) is a relaxation technique that involves systematic contraction and relaxation of muscle groups combined with controlled breathing, aiming to reduce muscle tension, anxiety, and pain (Khir et al., 2024). Previous studies suggest that PMR may reduce pain intensity in various clinical conditions; however, its application and effectiveness in labor, particularly during the active phase of the first stage, remain insufficiently explored (Sinha, Barman, Goyal, & Patra, 2021).

Effective non-pharmacological pain management during labor is essential, especially in primary healthcare and independent midwifery practice settings where pharmacological options are limited. Uncontrolled labor pain can trigger physiological stress responses, including hyperventilation, altered blood gas levels, uterine vasoconstriction, and reduced uteroplacental oxygenation, which may adversely affect both the mother and the fetus.(Sample, Abdul, Diorgu, & Eleke, 2025).Although PMR is simple, inexpensive, and easy to apply, its implementation in routine midwifery care is not yet standardized, and evidence regarding its effectiveness during labor is still inconsistent. This highlights the need for further research to support the integration of PMR into evidence-based midwifery practice(lalu muhammad saleh, 2023).

A review of previous studies indicates that most non-pharmacological labor pain management research has focused on breathing techniques, massage, or combined relaxation methods, while studies specifically examining PMR in laboring women remain limited. Existing studies often use pre-experimental designs without control groups, making it difficult to draw strong causal conclusions. Moreover, there is a lack of research conducted in real-world midwifery practice settings, particularly in primary healthcare facilities. Therefore, a clear research gap exists regarding the effectiveness of PMR compared with standard maternal care in reducing labor pain during the active phase of the first stage of labor.

This study is expected to contribute theoretically by strengthening the scientific evidence on the effectiveness of Progressive Muscle Relaxation as a non-pharmacological intervention for labor pain management. Practically, the findings may serve as a basis for midwives to incorporate PMR into routine labor care as a safe, low-cost, and easily applicable intervention. The aim of this study is to evaluate the effectiveness of Progressive Muscle Relaxation compared with standard maternal care in reducing labor pain intensity during the active phase of the first stage of labor in the working area of the Kedondong Health Center, Pesawaran Regency.

Based on the above data, the researcher is interested in researching the Effectiveness of Progressive Muscle Relaxation Techniques in Reducing Labor Pain in the Working Area of the Kedondong Health Center, Pesawaran Regency in 2025.

METHODS

This study used a quantitative, quasi-experimental design with a two-group pretest–posttest approach. The study was conducted from February to May 2025 in the working area of Kedondong Health Center, Pesawaran Regency, involving six independent midwifery practices. The population consisted of 51 laboring women. A total of 32 participants meeting the inclusion criteria were selected using accidental sampling and allocated into intervention and control groups (16 each). Inclusion criteria included uncomplicated labor, singleton cephalic presentation, and willingness to participate. Exclusion criteria included preterm labor, fetal distress, and maternal complications.

Random sampling was chosen to reduce selection bias and ensure that every mother in the target population had an equal opportunity to participate, thus ensuring that the sample characteristics were more representative of the population. This resulted in more objective research results, and variations in individual characteristics (e.g., age, parity, and anxiety levels) were more evenly distributed. This approach enhanced external validity, ensuring greater generalizability of research findings to populations of mothers with similar characteristics,

although generalizations were still limited by the context of the service facility and the study's inclusion criteria.

The intervention group received Progressive Muscle Relaxation for 15–30 minutes during contractions, while the control group received standard maternal care without structured relaxation techniques. Pain intensity was measured using the Wong–Baker Faces Pain Rating Scale before and after the intervention. Data were analyzed using the Wilcoxon Signed-Rank Test and Mann–Whitney U Test with a significance level of $p < 0.05$. Ethical approval was obtained from the Research Ethics Commission of Universitas Malahayati (No. 4714/EC/KEP-UNMAL/IV/2025).

RESULTS

This study used a quasi-experimental design with a two-group pretest-posttest. The study was conducted from February to May 2025 in the Kedondong Community Health Center, Pesawaran Regency. Of the 51 women in labor, 32 were selected, 16 in the intervention group and 16 in the control group.

Descriptive Statistic

Table 1 summarises the basic characteristics of the study participants. The age category is considered at risk if the age is <20 years and >35 years and not at risk if the age is 20-35 years, and the parity category is primipara if the participant has given birth once, multipara if the participant has given birth more than twice, and grandemultipara if the participant has given birth more than four times.The basic characteristics between the experimental and control groups were comparable.

Primary Outcome Measures

Table 5 explains the main results based on the Wilcoxon Signed Ranks Test results on pain scores before and after the intervention in the progressive muscle relaxation group, obtaining a significance value (Asymp. Sig. 2-tailed) of<0,001. All respondents (n=16) showed a decrease in pain levels after the intervention, indicated by a negative ranking of 16 respondents (100%). No respondents experienced an increase in pain or no change (positive ranking and tie = 0). In the control group that was not given a relaxation intervention, the Wilcoxon Signed Ranks Test results showed a significance value of 0.002. Of the 16 respondents, 10 respondents (62.5%) experienced a decrease in pain (negative ranking), while 6 respondents (37.5%) experienced no change in pain (tie). None of the respondents experienced an increase in pain (positive ranking = 0). The reduction in labor pain was greater and more consistent in the intervention group than in the control group, suggesting that the intervention was more effective in alleviating labor pain.

Secondary Outcome Measures

In addition to the primary outcomes, secondary analysis was conducted to examine changes in labor pain intensity before and after the intervention in the intervention group. Prior to the intervention, the mean labor pain score was **7.06 ± 0.77**, with a range of **6–8** and a median score of **7**. After the intervention, the mean pain score decreased to **5.44 ± 0.81**, with scores ranging from **4–7** and a median score of **5**. This reflects a **mean reduction of 2 points** in labor pain intensity following the progressive muscle relaxation intervention. The Wilcoxon signed-rank test further confirmed that this reduction was statistically significant (**p = 0.001**), indicating that progressive muscle relaxation is effective in reducing perceived labor pain among laboring mothers.

Subgroup Analysis

Subgroup analysis showed that labor pain decreased more in the intervention group than in the control group. The intervention group's mean pain score declined from 7.06 to 5.44,

while the control group showed a smaller reduction from 6.63 to 6.00, indicating the effectiveness of progressive muscle relaxation in reducing labor pain.

Table 1. Characteristics of Respondents at in the working area of Kedondong Public Health Center, Bandar Lampung, 2025

Variables	Intervention		Control	
	n	%	n	%
Age				
20 – 35 years old	15	93.7	16	100
>35 years old	1	6.3	0	0.0
Paritas				
Primipara	6	37.5	3	18.8
Multipara	10	62.5	13	81.2
TOTAL	16	100.0	16	100.0

Based on table 1 above, it is known that of the 16 respondents in the intervention group aged 20-35 years, 15 (93.7%), and 10 (62.5%) respondents with multipara parity. In the control group aged 20-35 years as many as 16 (100.0%), and respondents with multipara parity as many as 13 (81.2%).

Table 2. Average labor pain before and after in the intervention group in the Kedondong Health Center Working Area of Pesawaran Regency in 2025

Labor pain	Mean	SD	Min	Max	n
Before	7.06	0.77	6	8	16
After	5.44	0.81	4	7	16

Based on table 2 above, it is known that the intervention group is maternity mothers who are given progressive muscle relaxation techniques. in this study, the results obtained for the group given PMR intervention were analysis showed that before the intervention, the average pain value was 7.06, with a minimum score of 6 and a maximum of 8, and a standard deviation of 0.77. The median pain is 7. After the intervention, the mean pain value decreased to 5.44, with a minimum score of 4 and a maximum of 7, and a standard deviation of 0.81. The median pain is 5. There was a decrease in pain score by 2 points on average after the intervention of progressive muscle relaxation techniques. This shows that the intervention has the potential to reduce the perception of pain in maternity mothers

Table 3 Average labor pain before and after in the control group in the Kedondong Health Center Working Area of Pesawaran Regency in 2025

Labor pain	Mean	SD	Min	Max	n
Before	6.63	0.71	6	8	16
After	6.00	0.73	5	7	16

Based on table 3 above, In this study, the results obtained for the group that was not given PMR intervention were known that the average labor pain before giving to the control group is 6.63, with a standard deviation of 0.71, a minimum value of 6 and a maximum value of 8, while the average labor pain after giving to the control group is 6.00, with a standard deviation of 0.73, a minimum value of 5 and a maximum value of 7.

Based on table 4 of the *Shapiro-Wilk* test ($n < 50$), the significance value (Sig.) for all groups < 0.05, the data is not normally distributed. Thus, for the next bivariate analysis (difference test), the *Mann-Whitney U Test is used non-parametric test*.

Table 4 Data Normality Test

Variables	Labor pain	*Shapiro Wilk*	Information
Intervention	Before	0.005	
	After	0.006	Non Normally
Control	Before	0.001	
	After	0.005	Non Normally
Difference	Intervention	0.001	
	Control	<0.001	Non Normally

Table 5 The effectiveness of progressive muscle relaxation techniques in reducing labor pain in the Kedondong Health Center Working Area of Pesawaran Regency in 2025

Variables	Labor pain	Median	Min-max	Negative ranks	Positive ranks	Ties	p-value
Intervention	Before	7.00	6-8	16	0	0	0.001
	After	5.00	4-7				
Control	Before	6.50	6-8	10	0	6	0.002
	After	6.00	5-7				

Based on Table 5, the results of the *Wilcoxon Signed Ranks* Test on pain scores before and after the intervention in the progressive muscle relaxation group, a significance value (*Asymp. Sig. 2-tailed*) of 0.001 was obtained. All respondents (n = 16) showed a decrease in pain levels after the intervention, which was shown by the number of negative ranks of 16 respondents (100%). There were no respondents who experienced increased pain or who did not experience changes (positive ranks and ties = 0). In the control group that was not given a relaxation intervention, the results of *the Wilcoxon Signed Ranks Test* showed a significance value of 0.002. Of the 16 respondents, as many as 10 respondents (62.5%) experienced a decrease in pain (negative ranks), while 6 respondents (37.5%) did not experience any change in pain (ties). None of the respondents experienced increased pain (positive ranks = 0).

Table 6 The effectiveness of progressive muscle relaxation techniques in reducing labor pain in the Kedondong Health Center Working Area of Pesawaran Regency in 2025

Pain Reduction Difference	Mean rank	p-value
Intervention	22.31	<0.001
Control	10.69	

Based on Table 6, the Mann-Whitney Test was used to determine the difference in pain reduction between the intervention group (which received the progressive muscle relaxation technique) and the control group (which did not receive special treatment). The analysis showed that the mean rank in the intervention group was 22.31, while in the control group it was 10.69. The statistical value of the Mann-Whitney U significance value (Asymp. Sig. 2-tailed) is 0.001. Because the significance value was less than 0.05 ($p < 0.05$), it can be concluded that there was a significant difference in pain reduction between the intervention group and the control group

DISCUSSION

Interpretation of Key Findings

Most of the respondents were of healthy reproductive age (20–35 years). Age variation did not have a significant effect on the effectiveness of progressive muscle relaxation techniques in reducing labor pain. The decrease in pain is more influenced by psychological factors, mental readiness, and coping ability than biological age. Based on parity, multipara showed a greater reduction in pain than primipara, likely due to previous labor experience. However, without relaxation interventions, the reduction in pain remains limited.In the control group, the pain

reduction was minimal (0–1 points) and tended to be influenced by internal factors such as experience, emotional support, and mental readiness, rather than active intervention (Linton, S. J., & Shaw, 2011). Overall, age and parity are not dominant factors, as the perception of pain is subjective and strongly influenced by psychological conditions and social support (Lowe & Lowe, 2002).

Progressive Muscle Relaxation Therapy is a movement and breathing exercise with a slow and deep breathing technique using the respiratory muscles, so that the abdomen can be lifted slowly and the chest can expand fully, holding inspiration to the maximum and then exhaling slowly. In general, the aim of relaxation is to reduce the level of anxiety in terms of individual physiology and bring the individual to a calmer state both physically and psychologically (Mulyati, Novita, & Trisna, 2021).

Progressive Muscle Relaxation Therapy works by reducing muscle tension and increasing relaxation, thereby helping to reduce labor pain (Herlina, Wijayanto, & Amirudin, 2024). During labor, a mother's body often experiences tension due to intense contractions and anxiety. This technique gradually relaxes tense muscles, from the toes to the face, providing a calming effect and increasing comfort. Furthermore, progressive muscle relaxation helps increase blood flow and oxygenation to tissues, including the uterus, which plays a role in reducing pain from contractions. Increased blood circulation allows contracting muscles to work more efficiently, reducing excessive pain. This technique also plays a role in inhibiting the transmission of pain impulses to the brain by stimulating the release of endorphins, the body's natural pain-relieving hormones (Heni Frilasari & Heri Triwibowo, 2020).

The intervention group consisted of 16 mothers who were given progressive muscle relaxation techniques. Before the intervention, the mean labor pain was 7.06 (SD 0.77; min–max 6–8; median 7). After the intervention, the mean pain decreased to 5.44 (SD 0.81; min–max 4–7; median 5), with an average decrease of 2 points. These findings suggest that progressive muscle relaxation techniques have the potential to clinically reduce the perception of labor pain. Labor pain is a complex experience that involves physiological and psychological components.(Frilasari, Heni, 2020). These results are in line with the research of Frilasari & Triwibowo (2020), (Pratamaningtyas, 2020), and (Made et al., 2024) which showed a decrease in pain levels after progressive relaxation interventions. Mechanismally, this technique combines breathing and muscle stretching, shifting focus away from pain, lowering peripheral resistance, increasing blood flow, and inhibiting the transmission of pain impulses through the "gate control" mechanism.(Deno, Bratajaya, & Hidayah, 2022).The variation in pain reduction between respondents was influenced by internal factors such as the ability to apply techniques, anxiety levels, childbirth experience (parity), and physiological conditions of childbirth (Meštrović, Bilić, Lončar, Mičković, & Lončar, 2015). External factors include emotional support, midwife guidance, and environmental conditions of delivery (Meyer, Lee, George, & Kearney, 2024). To increase effectiveness, this technique should be taught from the third trimester, given direct assistance during childbirth, and adjusted to the mother's emotional condition. Overall, progressive muscle relaxation techniques have been shown to be beneficial in lowering labor pain,(Guzewicz, 2022) although their levels of effectiveness vary. Early implementation and personalization of interventions are recommended for optimal outcomes.

In the control group (n=16) that did not receive the intervention, the mean pain before observation was 6.63 (SD 0.71; mean–max 6–8; median 6.5). After observation, the mean pain decreased slightly to 6.00 (SD 0.73; min–max 5–7; median 6.0), with a decrease of 0.63 points that was not clinically significant. These findings are consistent with the research of which showed that without active interventions, the reduction in pain is more due to natural physiological adaptations, which are limited. Unresolved pain can trigger systemic stress response, hyperventilation, alkalosis, impaired oxygen transfer to the fetus, and prolong labor (Melaku, 2022). The absence of active coping techniques makes respondents only rely on the body's natural adaptation. Psychological factors such as anxiety, fear, low emotional support, and a less conducive environment exacerbate the perception of pain (Chairani, Intasir, & Sari, 2025). Even in multiparapara, previous experience does not necessarily reduce pain if it is not supported by the right pain management strategy. Based on these results, non-pharmacological

interventions such as progressive muscle relaxation techniques are important to be integrated into childbirth care, to help mothers manage pain effectively and prevent negative physiological impacts on the mother and fetus (Cecagno, 2021).

Comparison with Previous Studies

The Mann–Whitney test showed a significant difference between the intervention and control groups ($p<0.001$), indicating that Progressive Muscle Relaxation (PMR) effectively reduced labor pain intensity. The intervention group experienced a greater decrease in pain scores compared to the control group, supporting findings from previous studies. Physiologically, PMR reduces muscle tension, improves oxygen circulation, and inhibits pain impulse transmission. Psychologically, it decreases anxiety and enhances maternal comfort and sense of control. Variations in outcomes were influenced by individual pain thresholds, anxiety levels, childbirth experience, family support, and environment. Overall, PMR is a safe, simple, and side-effect-free non-pharmacological method that can be integrated into routine labor pain management through antenatal education, health worker training, and supportive birthing environments.

Almost all respondents experienced a reduction in pain intensity after receiving the deep breathing relaxation technique. Wilcoxon test analysis showed a p-value < 0.001, which is lower than the significance level of 0.05, indicating a statistically significant effect of deep breathing relaxation on the reduction of labor pain. The study concludes that the deep breathing relaxation technique significantly reduces pain intensity among women during the active phase of the first stage of labor. (Tandondo, 2025)

The intensity of pain were felt by the woman before the intervention was given as many as 24 woman (80%) were in the range of moderate pain 6 woman (20%) severe pain. After painful inntensity as much as 27 women (90%) were in the range of mild pain and 3 woman (10%) moderate pain. Based on the assessment using numbers before the majority pain intervention there were 6 values of 19 (63%) and after the majority pain intervention there was a value of 4 as many as 16 (53%) (Nasution & Ariga, 2020). The application of progressive muscle relaxation therapy may be useful in lowering patients' anxiety prior to cesarean sections, it might be inferred. As an alternative to lowering patients' dread of cesarean sections (Herlina et al., 2024).

Implications for Public Health

The implications of this study extend to public health, By reducing pain, pregnant women can experience a more comfortable and positive birth reduced anxiety and fear: In addition to pain, this technique is also effective in reducing the anxiety, stress, and fear that often accompany labor, especially in primigravida mothers.More natural birth: The application of relaxation techniques can reduce the need for pain relief (pharmacological), thus supporting a more natural birth and minimizing medical intervention.Empowering knowledge: Pregnant women who receive education and training in this technique will feel more empowered and in control of their labor process (Anuhgera, Apryanti, & Lushinta, 2025).

Limitations and Cautions

Although Progressive Muscle Relaxation (PMR) is effective in reducing labor pain, several limitations must be considered. Its effectiveness varies among individuals, as some mothers experience significant benefits while others show minimal or no improvement. PMR is a non-pharmacological method and cannot replace medical pain management, serving only as a complementary intervention. Some laboring mothers may find it difficult to concentrate due to anxiety or psychological distress, and PMR may be unsuitable for those with trauma histories without professional support. Additionally, variability in participant characteristics, baseline psychological conditions, facilitator skills, and communication styles limits standardization. Potential confounding factors, such as environmental conditions, companion support, and other concurrent interventions, may also influence outcomes.

Recommendations for Future Research

Recommendations for future research will focus on improving understanding of the mechanisms, effectiveness, and implementation of PMR in obstetric care. Future studies should utilize RCT designs with larger sample sizes and more rigorous methodology. This will reduce the risk of bias and improve the quality of evidence, especially since several systematic reviews have noted low-quality evidence in existing PMR studies.

CONCLUSION

Progressive Muscle Relaxation (PMR) was shown to be effective in reducing labor pain among women in the Kedondong Health Center working area, Pesawaran Regency, in 2025 (p-value = 0.001). PMR is recommended to be introduced from the third trimester through antenatal classes, video guidance, or support from health workers to improve mental and physical readiness for childbirth. PMR functions not only as a muscle relaxation technique but also as a therapeutic communication intervention. Its effectiveness depends on physical relaxation, cognitive engagement, a sense of security, and the therapeutic relationship between the midwife and the mother. Implemented during the first stage of labor, PMR helps reduce pain perception and anxiety.

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