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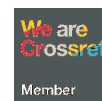
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Effects of progressive muscle relaxation on stress, anxiety, and depression in university students: a quasi-experimental controlled trial

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ABSTRACT

Stress, anxiety, and depression are prevalent and co-occurring conditions among university students that significantly impair academic functioning and overall well-being. Progressive Muscle Relaxation (PMR) has theoretical and empirical support as a psychophysiological intervention targeting somatic arousal, but evidence from Indonesian university contexts examining all three outcomes simultaneously remains limited. This quasi-experimental study employed a two-group pretest–posttest design to examine the effects of a five-day PMR intervention on stress, anxiety, and depression among psychology students at a public university in West Sumatra, Indonesia. A total of 60 participants meeting inclusion criteria of high or very high DASS-42 scores were assigned to an experimental group ($n = 30$) or a no-intervention control group ($n = 30$). Outcomes were measured using the Indonesian-adapted DASS-42. Normality was assessed using the Shapiro–Wilk test; stress and anxiety met normality assumptions and were analyzed using paired-sample t -tests, while depression in the experimental group showed a severe normality violation at posttest ($W = .882, p = .002$) and was analyzed using the Wilcoxon signed-rank test. The experimental group demonstrated statistically significant reductions in stress ($M: 29.63$ to $22.10, d = 0.84$), anxiety ($M: 25.17$ to $18.37, d = 0.78$), and depression ($M: 22.57$ to $14.47, r = .54$), all $p < .001$, reflecting large to medium-to-large effect sizes. The control group showed non-significant changes across all outcomes. However, the absence of between-group statistical comparisons, follow-up data, and feasibility metrics limits the strength of causal and practical conclusions. Future research should employ randomized controlled designs with active comparison conditions and follow-up assessments to establish the durability and specificity of PMR effects.

Keywords:

Progressive muscle relaxation
Psychological distress
Quasi-experimental study
DASS-42
Indonesian university Students

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Introduction

Stress, anxiety, and depression are increasingly recognized as major global health concerns, contributing substantially to the global burden of disease and disproportionately affecting young adults in university settings (Auerbach et al., 2019; Li et al., 2022). University students face a uniquely convergent set of stressors, including intensive academic demands, social transitions, and identity development pressures, that render them particularly vulnerable to psychological distress (Haruna

et al., 2025; Tyagi et al., 2025). Epidemiological evidence consistently documents elevated prevalence rates of these conditions among student populations: globally, approximately 33.6% of college students meet criteria for depression and 39.0% for anxiety (Li et al., 2022), rates that substantially exceed those observed in age-matched non-student populations (January et al., 2018). Longitudinal research further confirms that untreated psychological distress during university years predicts poorer academic performance, reduced psychosocial functioning, and increased risk of dropout (Kandasamy et al., 2025), underscoring the urgent need for effective, scalable psychological interventions within higher education contexts. Within Indonesia specifically, a study among 592 psychology students at Universitas Negeri Padang documented predominantly high levels of stress, anxiety, and depression across both genders (Nurmina et al., 2021), reflecting the broader global pattern and highlighting the local relevance of this concern.

Academic stress constitutes the most consistently documented precipitant of psychological distress in undergraduate populations. Intensive coursework, frequent assessment demands, and high performance expectations are robustly associated with elevated anxiety and depressive symptoms (Yulina et al., 2025), with longitudinal research confirming that academic stress directly and significantly predicts poorer psychological well-being over time (Córdova Olivera et al., 2023). Beyond academic factors, ecological determinants, including limited access to mental health services, inadequate social support, and cumulative environmental stressors, further compound psychological vulnerability among students (Othman et al., 2019; Yu et al., 2022). Critically, stress, anxiety, and depression frequently co-occur and mutually reinforce one another (Asif et al., 2020), suggesting that effective interventions must simultaneously address all three constructs rather than targeting each in isolation.

Given the multidimensional nature of student psychological distress, there is a compelling case for interventions that operate at the psychophysiological interface, targeting the somatic substrates of stress arousal to produce downstream psychological benefits. Progressive Muscle Relaxation (PMR), a structured technique involving the systematic tensing and releasing of specific muscle groups, is theoretically grounded in Jacobson's (1938) neuromuscular model, which posits that residual skeletal muscle tension is both a consequence and a maintainer of psychological stress and anxiety. By inducing deep muscular relaxation, PMR activates the parasympathetic nervous system and suppresses sympathoadrenal arousal, leading to reductions in cortisol secretion, heart rate, and subjective stress experience, a response elaborated in Benson's (1975) relaxation response theory. This psychophysiological mechanism directly addresses the somatic arousal underlying anxiety, the allostatic load contributing to stress, and the physiological hyperactivation associated with depressive states, providing a theoretically coherent rationale for PMR's application across all three outcome domains simultaneously. Crucially, this mechanism distinguishes PMR from other relaxation techniques: unlike mindfulness-based approaches that primarily target cognitive and attentional processes, or deep breathing techniques that operate primarily through respiratory modulation, PMR specifically targets the neuromuscular pathway, making it uniquely suited for populations experiencing somatic manifestations of psychological distress (Muhammad Khir et al., 2024).

Empirical evidence supports this theoretical rationale. A systematic review by Muhammad Khir et al. (2024) synthesizing 38 controlled studies confirmed that PMR produces significant reductions in stress (pooled $d = 0.56$), anxiety (pooled $d = 0.63$), and depression across adult populations, with effect sizes in the small-to-medium range. Among university students specifically, Anuar et al. (2019) demonstrated significant academic stress reductions following a structured PMR program ($n = 60$), while Carisa and Wahyuni (2022) reported significant anxiety reductions among Indonesian medical students ($n = 34$) following a brief PMR intervention. Additionally, Chen et al. (2009) documented significant anxiety reductions following PMR in clinical populations, and Chellew et al. (2015) provided direct physiological evidence linking PMR practice to measurable reductions in daily cortisol secretion, corroborating the proposed psychophysiological mechanism.

Despite this growing evidence base, critical gaps remain. First, only two published studies have examined PMR among Indonesian university students (Anuar et al., 2019; Carisa & Wahyuni, 2022), both relying on small samples ($n < 60$) and examining either stress or anxiety in isolation, without simultaneously assessing the full triad of stress, anxiety, and depression within a controlled experimental framework. Second, the systematic review by Muhammad Khir et al. (2024) identified a notable scarcity of high-quality experimental studies from Southeast Asian university contexts, limiting the generalizability of Western and Middle Eastern findings to Indonesian sociocultural settings. Third, no published study to date has examined PMR's simultaneous effects across all three psychological outcomes among psychology students, a population with potentially heightened awareness of and sensitivity to psychological distress, within an Indonesian higher education context. These gaps collectively indicate that the evidence base for PMR as a multi-outcome intervention in Indonesian university settings remains insufficient and warrants rigorous experimental investigation.

The present study addresses these gaps by employing a quasi-experimental two-group pretest-posttest design to examine the simultaneous effects of a five-day PMR intervention on stress, anxiety, and depression among psychology students at a public university in West Sumatra, Indonesia. The novelty of this study lies in its multi-outcome approach, its contextual grounding in Indonesian higher education, and its contribution of preliminary empirical evidence to a literature dominated by descriptive and correlational designs. Specifically, this study aims to: (1) examine whether PMR training significantly reduces stress levels among psychology students at a public university in West Sumatra, Indonesia between pretest and posttest measurements; (2) assess whether PMR training significantly reduces anxiety levels; and (3) evaluate whether PMR training significantly reduces depressive symptoms following a five-day intervention period. It is hypothesized that participants receiving PMR training will demonstrate statistically significant reductions in stress, anxiety, and depression from pretest to posttest.

Methods

This study employed a quasi-experimental two-group pretest-posttest design to examine the effects of Progressive Muscle Relaxation (PMR) training in reducing stress, anxiety, and depression among university students. The independent variable was PMR training, while the dependent variables were stress, anxiety, and depression levels. Stress was conceptualized as a physiological, cognitive, and emotional reaction arising from academic pressures, anxiety as a psychological response to perceived threats, and depression as a persistent negative mood accompanied by diminished interest in daily activities (Grupe & Nitschke, 2013; Haruna et al., 2025; Tyagi et al., 2025).

The target population consisted of 882 psychology students at a public university in West Sumatra, Indonesia. Participants were selected using purposive sampling based on two inclusion criteria: (1) obtaining scores in the high or very high category on the DASS-42 stress or anxiety subscales, corresponding to subscale scores of 19 for stress and 10 for anxiety per established DASS-42 scoring guidelines (Lovibond & Lovibond, 1995), and (2) willingness to participate in the intervention as indicated by signed informed consent. A total of 60 participants met the inclusion criteria and were enrolled in the study, with 30 assigned to the experimental group and 30 to the control group. Group assignment was conducted systematically based on participant registration order, with odd-numbered registrants assigned to the experimental group and even-numbered registrants assigned to the control group. This assignment procedure was employed as a pragmatic alternative to random assignment given the naturalistic university setting, consistent with quasi-experimental design conventions (Kazdin, 2007).

The experimental group received PMR training for five consecutive days, with each session conducted for approximately 15 minutes each morning. The intervention followed a structured protocol involving progressive tensing and releasing of major muscle groups, including the arms, shoulders, neck, face, abdomen, and legs, consistent with established PMR procedures documented in prior research (Anuar et al., 2019; Muhammad Khir et al., 2024). Each session was guided by

standardized audio instructions to ensure procedural consistency across participants. Participants were provided with daily monitoring sheets to record session completion, perceived relaxation levels, and any difficulties encountered during practice. The control group received no intervention during the study period and completed pretest and posttest measurements under identical conditions.

Stress, anxiety, and depression were assessed using the Indonesian-adapted version of the Depression Anxiety Stress Scale or DASS-42 (Lovibond & Lovibond, 1995; Makara-Studzińska, M., et al., 2022; Sulak, S. A., & Koklu, N., 2024), comprising 42 items rated on a four-point Likert scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). The DASS-42 yields three subscale scores corresponding to depression, anxiety, and stress, with higher scores indicating greater symptom severity. Scores are classified into five severity categories: normal, mild, moderate, severe, and extremely severe. The DASS-42 has demonstrated adequate psychometric properties in Indonesian university student samples in prior research (Fauzi et al., 2021). Although depression was not part of the inclusion criteria, it was included as an outcome variable to examine the broader impact of PMR on psychological distress.

Between-group statistical comparisons were not conducted, as the primary focus of the study was to examine within-group pre-post changes following the intervention. Data were analyzed using descriptive and inferential statistics. Normality of score distributions was examined using the Shapiro-Wilk test prior to hypothesis testing. For stress and anxiety, where normality assumptions were met ($p > .05$), paired-sample t-tests were used to examine within-group pre-post differences. For depression in the experimental group, where posttest scores showed a severe violation of normality (Shapiro Wilk $p = .002$), the Wilcoxon signed-rank test was used as the primary non-parametric alternative. For the control group's depression scores, which met normality at both time points ($W = .941$, $p = .072$ at pretest; $W = .944$, $p = .108$ at posttest), paired-sample t-tests were retained. Statistical significance was set at $\alpha = .05$ for all analyses. Effect sizes were calculated using Cohen's d for parametric analyses and r for the non-parametric analysis, interpreted according to Cohen's (1988) conventional benchmarks: small ($d = .20$), medium ($d = .50$), and large ($d = .80$) for Cohen's d , and small ($r = .10$), medium ($r = .30$), and large ($r = .50$) for r .

This study was conducted in accordance with the ethical principles governing research with human participants. All participants provided written informed consent prior to enrollment, were informed of their right to withdraw at any time without consequence, and were assured of data confidentiality. Participant data were anonymized and stored securely throughout the study period.

Results and Discussion

Normality Testing

Prior to hypothesis testing, the distribution of pretest and posttest scores was examined using the Shapiro Wilk test for all variables across both groups. Results indicated that stress and anxiety scores were normally distributed at both time points across both groups (all $p > .05$). Depression scores met normality at pretest in both the experimental ($W = .930$, $p = .050$) and control groups ($W = .941$, $p = .072$). Depression pretest scores in the experimental group ($W = .930$, $p = .050$) were treated as meeting the normality assumption given that the p -value did not fall below the predetermined $\alpha = .05$ threshold. However, a severe normality violation was observed in the experimental group's depression posttest scores ($W = .882$, $p = .002$), likely reflecting heterogeneous response patterns following the intervention. The control group's depression posttest scores remained normally distributed ($W = .944$, $p = .108$). Consequently, parametric paired t-tests were used for stress and anxiety analyses in both groups, as well as for the control group's depression analysis. The Wilcoxon signed-rank test was employed for the experimental group's depression analysis given the severe normality violation. Results of the normality test are presented in Table 1.

Table 1. Shapiro Wilk Normality Test Results

Variable	Group	Time Frame	W	p-value
Stress	Experiment	Pre	.948	.157
		Post	.957	.334
	Control	Pre	.946	.130
		Post	.951	.187
Anxiety	Experiment	Pre	.963	.617
		Post	.955	.266
	Control	Pre	.950	.175
		Post	.953	.203
Depression	Experiment	Pre	.930	.050
		Post	.882	.002*
	Control	Pre	.941	.072
		Post	.944	.108

Note. $p = .002$ indicates severe violation of normality; Wilcoxon signed-rank test used for experimental group depression posttest analysis.

Intervention Effectiveness

Descriptive statistics and inferential test results are presented in Table 2. A total of 60 participants completed the study ($n = 30$ experimental, $n = 30$ control). The experimental group demonstrated statistically significant reductions across all three DASS-42 subscales following the five-day PMR intervention, whereas the control group showed non-significant changes across all outcomes.

For stress, the experimental group's scores declined from $M = 29.63$ ($SD = 6.76$) at pretest to $M = 22.10$ ($SD = 11.31$) at posttest, a mean reduction of 7.53 points, $t(29) = 4.65$, $p < .001$, Cohen's $d = 0.84$, indicating a large effect. The control group's stress scores showed a smaller, non-significant reduction from $M = 29.40$ ($SD = 6.13$) to $M = 27.03$ ($SD = 7.76$), a mean reduction of 2.37 points, $t(29) = 1.84$, $p = .076$.

For anxiety, the experimental group's scores decreased from $M = 25.17$ ($SD = 6.57$) at pretest to $M = 18.37$ ($SD = 10.35$) at posttest, a mean reduction of 6.80 points, $t(29) = 5.80$, $p < .001$, Cohen's $d = 0.78$, indicating a medium-to-large effect. The control group's anxiety scores showed a smaller, non-significant reduction from $M = 26.00$ ($SD = 6.10$) to $M = 21.07$ ($SD = 7.22$), a mean reduction of 4.93 points, $t(29) = 1.72$, $p = .096$.

For depression, the experimental group's scores declined from $M = 22.57$ ($SD = 10.21$) at pretest to $M = 14.47$ ($SD = 11.95$) at posttest, a median reduction of 8.10 points, $Z = -4.16$, $p < .001$, $r = .54$, indicating a large effect. The control group's depression scores showed a smaller, non-significant reduction from $M = 20.57$ ($SD = 9.34$) to $M = 17.93$ ($SD = 9.59$), a mean reduction of 2.64 points, $Z = -1.41$, $p = .158$.

Table 2. Pretest and Posttest Means, Standard Deviations, and Paired-Sample t-Test Results

Variable	Group	Pre M	Pre SD	Post M	Post SD	ΔM	ES	Statistic (p)
Stress	Experiment	29.63	6.76	22.10	11.31	7.53	$d = 0.84$	$t(29) = 4.65$, $p < .001$
	Control	29.40	6.13	27.03	7.76	2.37	–	$t(29) = 1.84$, $p = .076$
Anxiety	Experiment	25.17	6.57	18.37	10.35	6.80	$d = 0.78$	$t(29) = 5.80$, $p < .001$
	Control	26.00	6.10	21.07	7.22	4.93	–	$t(29) = 1.72$, $p = .096$
Depression ^a	Experiment	22.57	10.21	14.47	11.95	8.10	$r = 0.54$	$Z = -4.16$, $p < .001$
	Control	20.57	9.34	17.93	9.59	2.64	–	$Z = -1.41$, $p = .158$

Note. M = pretest minus posttest mean difference. ES = effect size. ^a Wilcoxon signed-rank test used for experimental group depression due to severe normality violation ($p = .002$); paired t-test used for control group depression ($W = .944$, $p = .108$). Cohen's d benchmarks: small = .20, medium = .50, large = .80. r benchmarks: small = .10, medium = .30, large = .50 (Cohen, 1988).

Changes in stress, anxiety, and depression levels across measurement points are illustrated in Figures 1, 2, and 3, respectively.

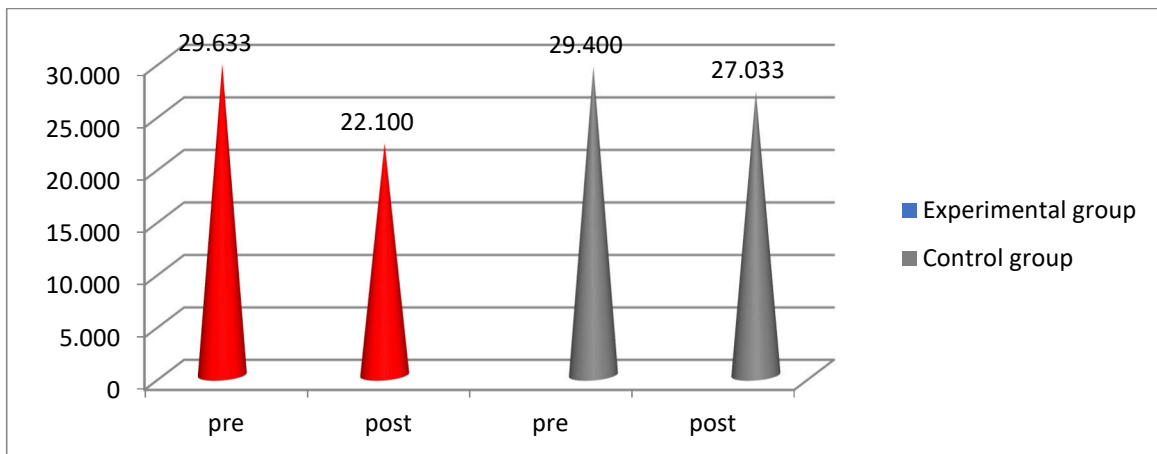


Figure 1 Mean Stress Scores at Pretest and Posttest for Experimental and Control Groups

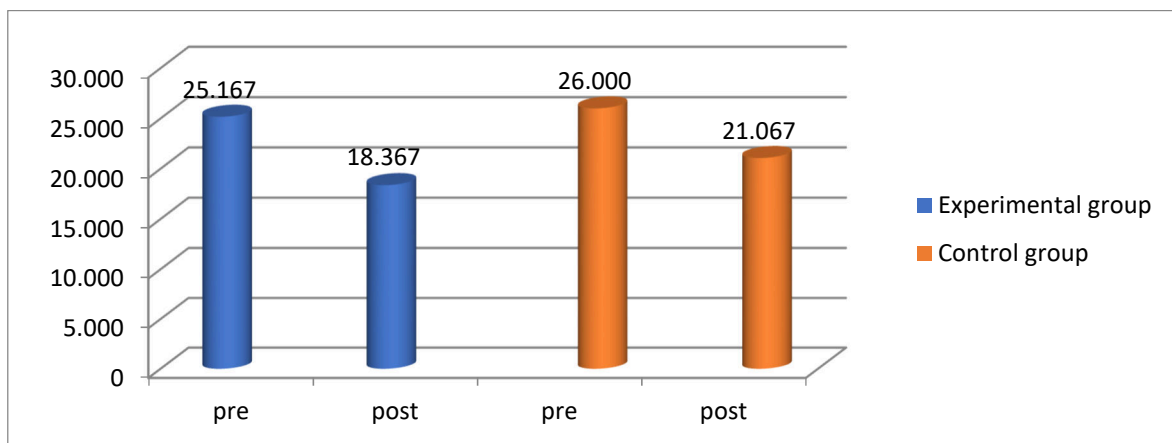


Figure 2 Mean Anxiety Scores at Pretest and Posttest for Experimental and Control Groups

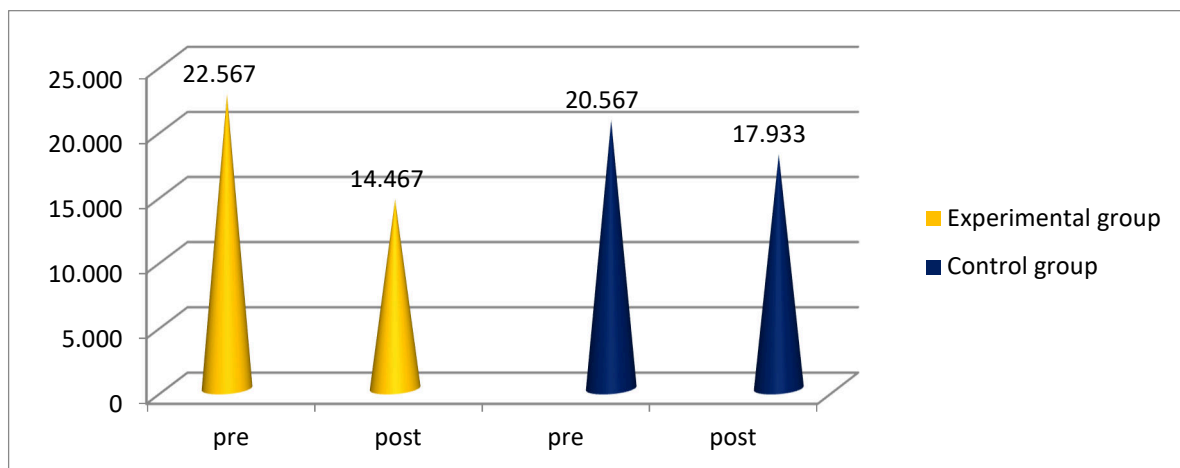


Figure 3 Mean Depression Scores at Pretest and Posttest for Experimental and Control Groups

Stress Outcomes

The experimental group demonstrated a large-effect reduction in stress following the five-day PMR intervention ($d = 0.84$), a magnitude that exceeds the pooled effect for stress reported in the systematic review by Muhammad Khir et al. (2024) across 38 controlled studies (pooled $d = 0.56$). As

illustrated in Figure 1, the experimental group showed a clear decline from pretest ($M = 29.63$) to posttest ($M = 22.10$), whereas the control group remained comparatively stable, declining only from $M = 29.40$ to $M = 27.03$. The non-significant change in the control group, $t(29) = 1.84$, $p = .076$, suggests that PMR may contribute to the observed reductions, although alternative explanations such as natural fluctuation or repeated measurement exposure cannot be ruled out (Kazdin, 2007).

This finding is consistent with the theoretical premise that PMR reduces stress through activation of the parasympathetic nervous system, suppression of sympathoadrenal arousal, and measurable reductions in cortisol secretion (Chellew et al., 2015), directly addressing the physiological substrates of the stress response. The concentrated five-day format, with sessions conducted at a consistent time each morning, may have facilitated a stronger early conditioning response compared to more dispersed protocols, potentially explaining the slightly elevated effect size relative to the meta-analytic benchmark. These findings are consistent with those of Anuar et al. (2019), who reported significant stress reductions among university students following a structured PMR program, and extend this evidence to psychology students within an Indonesian public university context.

Anxiety Outcomes

PMR was associated with a medium-to-large reduction in anxiety in the experimental group ($d = 0.78$). As shown in Figure 2, the experimental group's anxiety scores declined substantially from pretest ($M = 25.17$) to posttest ($M = 18.37$), $t(29) = 5.80$, $p < .001$. The control group showed a smaller, non-significant reduction from $M = 26.00$ to $M = 21.07$, $t(29) = 1.72$, $p = .096$. The anxiety effect size obtained ($d = 0.78$) is comparable to the pooled anxiety effect reported by Muhammad Khir et al. (2024) (pooled $d = 0.63$), suggesting that the brief five-day format was sufficient to produce meaningful anxiety reductions consistent with broader meta-analytic evidence.

Notably, the control group showed a non-significant 4.93-point reduction in anxiety, which warrants careful interpretation. This pattern is consistent with non-specific effects including increased self-monitoring awareness following initial assessment, spontaneous symptom fluctuation, and potential demand characteristics arising from awareness of group membership (Kazdin, 2007). Theoretically, PMR may help attenuate anxiety through reduction of somatic arousal, directly targeting the muscular tension and physiological hyperactivation that characterize anxiety responses (Grupe & Nitschke, 2013; Carver, M. L., & O' Malley, M. 2015; Liu, K., et al., 2020), while repeated practice may also foster interoceptive awareness and improved emotional regulation capacity. These findings are consistent with Carisa and Wahyuni (2022), who reported significant anxiety reductions among Indonesian medical students following PMR, corroborating the generalizability of PMR's anxiolytic effects across Indonesian student populations.

Depression Outcomes

Depression showed a large effect following PMR in the experimental group ($r = .54$), $Z = - 4.16$, $p < .001$. As illustrated in Figure 3, the experimental group's depression scores declined from $M = 22.57$ at pretest to $M = 14.47$ at posttest, a reduction of 8.10 points, whereas the control group showed a smaller, non-significant reduction from $M = 20.57$ to $M = 17.93$, $Z = - 1.41$, $p = .158$. The mechanism through which PMR reduces depressive symptoms is theoretically indirect: while PMR primarily targets somatic tension rather than the cognitive distortions central to depression (Jacob, S., & Sharma, S., 2018; Raad, G., et al., 2021), reductions in physiological hyperactivation may lower the somatic burden of depressive states, enhance perceived energy and coping capacity, and foster a sense of behavioral self-efficacy, all of which are recognized pathways through which relaxation-based interventions produce downstream mood improvements (Kazdin, 2007). The severe normality violation in experimental group depression posttest scores ($p = .002$) likely reflects the heterogeneous nature of depression responses, with some participants showing dramatic improvements and others showing minimal change. The use of the Wilcoxon signed-rank test for this outcome provides a statistically appropriate and conservative estimate of the intervention effect. These findings collectively suggest that PMR holds meaningful potential not only for reducing somatic arousal but also for indirectly alleviating depressive symptoms among university students, highlighting the

broader psychological benefits of structured relaxation interventions beyond their primary physiological targets.

Alternative Explanations and Threats to Validity

Several alternative explanations for the observed findings must be considered. First, the use of a no-intervention control condition means that expectancy effects, attention from the research team, and demand characteristics cannot be fully excluded as contributors to observed differences. Participants in the experimental group were aware of receiving an intervention, which may have elevated expectancy-driven improvements independent of PMR's specific mechanisms. Second, regression to the mean may partially account for improvements in both groups, given that participants were selected on the basis of elevated baseline scores. Third, the absence of between-group statistical comparisons of change scores represents a methodological limitation of the present study, and future research should incorporate such analyses to provide stronger preliminary empirical evidence for PMR's effects. Fourth, the brevity of the intervention, five consecutive days, raises questions regarding the durability of effects, as gains achieved through brief relaxation training may decay without continued practice maintenance.

Practical Implications

The effect sizes observed across all three outcomes ($d = 0.84$ for stress, $d = 0.78$ for anxiety, $r = .54$ for depression) suggest that a brief, structured PMR program can produce statistically significant short-term reductions in psychological distress among university students. However, given the absence of follow-up data and the methodological constraints of the present study, broader implementation recommendations await replication through more rigorous designs. PMR should be positioned as a brief adjunctive strategy within a broader stepped-care approach to university mental health rather than as a standalone treatment for students with clinically elevated distress.

Limitations

Several limitations must be acknowledged. First, the absence of follow-up assessment beyond the immediate posttest means that the sustainability of PMR effects is entirely unknown; prior meta-analytic evidence suggests that relaxation training benefits may decay without practice maintenance (Muhammad Khir et al., 2024). Second, the no-intervention control condition cannot exclude placebo, expectancy, or demand characteristic effects as partial contributors to observed differences; future studies should employ active control conditions such as psychoeducation or structured breathing exercises to isolate PMR-specific effects. Third, the absence of between-group statistical comparisons of change scores limits the strength of causal inferences that can be drawn from the present findings. Fourth, non-random group assignment may introduce unmeasured selection confounds, as formal statistical tests of baseline equivalence between groups were not conducted, which further limits causal inference. Fifth, the five-day intervention duration, while sufficient to produce significant short-term reductions, is too brief to assess dose-response relationships or longer-term maintenance of gains. Sixth, all outcomes were measured using self-report instruments, which are susceptible to response bias, social desirability effects, and demand characteristics. Seventh, the absence of blinding, participants knew their group assignment, may have amplified expectancy-driven improvements in the experimental group. Eighth, the sample was drawn from a single discipline at one Indonesian university, limiting generalizability to other student populations, academic disciplines, and cultural contexts. Future research should employ randomized controlled designs with active comparison conditions, include follow-up assessments at one, three, and six months post-intervention, incorporate between-group statistical comparisons of change scores, incorporate objective physiological outcome measures, and recruit diverse student samples to enhance external validity.

Conclusion

This study examined the effects of a five-day Progressive Muscle Relaxation (PMR) intervention on stress, anxiety, and depression among psychology students at a public university in West Sumatra, Indonesia who presented with high or very high levels of psychological distress. With respect to the

study's objectives, within-group analyses revealed statistically significant reductions from pretest to posttest in the experimental group across all three outcomes: (1) stress levels were significantly reduced, with a large effect; (2) anxiety levels were significantly reduced, with a medium-to-large effect; and (3) depressive symptoms were significantly reduced, with a large effect. The control group demonstrated non-significant changes across all three outcomes; however, causal attribution remains limited due to the absence of between-group statistical comparisons and the inability to exclude non-specific effects inherent in a no-intervention control design.

These findings must nonetheless be interpreted within the context of several important methodological constraints. First, the absence of follow-up assessment beyond the immediate posttest means that the durability of the observed reductions remains entirely unknown. Given that participants were selected on the basis of high or very high distress levels, a severity range typically associated with need for structured psychological intervention rather than prevention, the sustainability of gains achieved through a brief five-day protocol without continued practice support cannot be assumed. Second, the use of a no-intervention control condition precludes definitive conclusions regarding the specificity of PMR's effects, as placebo, expectancy, and demand characteristic contributions cannot be fully excluded. Third, the single-site, single-discipline sample limits the generalizability of findings to other student populations, academic disciplines, and cultural contexts beyond Indonesian public university psychology students.

The effect sizes obtained in this study, while statistically significant and consistent with meta-analytic benchmarks should be regarded as indicators of short-term symptom reduction rather than evidence of clinically meaningful or sustained recovery. PMR is therefore best positioned, based on the available evidence from this study, as a brief adjunctive strategy within a broader stepped-care approach to university mental health, one component among several rather than a standalone intervention for students with clinically elevated distress.

Future research should address the limitations of this study by: (1) employing randomized controlled designs with active comparison conditions to isolate PMR-specific effects from non-specific factors; (2) including follow-up assessments at a minimum of one and three months post-intervention to evaluate the sustainability of effects; (3) recruiting larger and more diverse samples across multiple universities, disciplines, and cultural contexts to enhance generalizability; (4) incorporating objective physiological outcome measures alongside self-report instruments to reduce response bias; and (5) examining implementation parameters, including optimal session frequency, duration, group versus individual format, required facilitator training, and cost per participant, before broader dissemination recommendations can be made with confidence.

In summary, this study provides preliminary evidence that a brief, structured PMR program can produce statistically significant short-term reductions in stress, anxiety, and depression among Indonesian university students with elevated psychological distress. These findings contribute context-specific evidence to the PMR literature from a Southeast Asian higher education setting, addressing a documented gap. Definitive conclusions regarding clinical significance, sustainability, and implementation feasibility await replication through methodologically more rigorous designs.

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References

- Anuar, A. Bin, Anas, M., & Samad, S. (2019). Effects of progressive muscle relaxation on academic stress in students. *Jurnal Psikologi Pendidikan Dan Konseling: Jurnal Kajian Psikologi Pendidikan Dan Bimbingan Konseling*, 5(2), 134. <https://doi.org/10.26858/jppk.v5i2.9147>

- Asif, S., Mudassar, A., Shahzad, T. Z., Raouf, M., & Pervaiz, T. (2020). Frequency of depression , anxiety and stress among university students. *Pak J Med Sci*, 36(5), 971–976.
<https://doi.org/10.12669/pjms.36.5.1873>
- Auerbach, R., Mortier, P., Bruffaerts, R., Alonso, J., Benjet, C., Cuijpers, P., Demyttenaere, K., Ebert, D., Green, J., Murray, E., Nock, M., Pinder-amaker, S., Sampson, N., Stein, D., Vilagut, G., Zaslavsky, A., & Kessler, R. (2019). The WHO World Mental Health Surveys International College Student Project: Prevalence and distribution of mental disorders. *Journal of Abnormal Psychology*, 127(7), 623–638. <https://doi.org/10.1037/abn0000362>
- Benson, H. (1975). *The relaxation response*. William Morrow.
- Carisa, F., & Wahyuni, O. D. (2022). Effect of Progressive Muscle Relaxation on Anxiety Level of Medical Faculty Students in Indonesia. *E-CliniC*, 10(2), 250.
<https://doi.org/10.35790/ecl.v10i2.39185>
- Carver, M. L., & O' Malley, M. (2015). Progressive muscle relaxation to decrease anxiety in clinical simulations. *Teaching and Learning in Nursing*, 10(2), 57–62.
- Chellew, K., Evans, P., Fornes-Vives, J., Pérez, G., & Garcia-Banda, G. (2015). The effect of progressive muscle relaxation on daily cortisol secretion. *Stress: The International Journal on the Biology of Stress*, 1–22. <https://doi.org/10.3109/10253890.2015.1053454>
- Chen, W. C., Chu, H., Lu, R. B., Chou, Y. H., Chen, C. H., Chang, Y. C., O' Brien, A. P., & Chou, K. R. (2009). Efficacy of progressive muscle relaxation training in reducing anxiety in patients with acute schizophrenia. *Journal of Clinical Nursing*, 18(15), 2187–2196. <https://doi.org/10.1111/j.1365-2702.2008.02773.x>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.
- Córdova Olivera, P., Gasser Gordillo, P., Naranjo Mejía, H., La Fuente Taborga, I., Grajeda Chacón, A., & Sanjinés Unzueta, A. (2023). Academic stress as a predictor of mental health in university students. *Cogent Education*, 10(2). <https://doi.org/10.1080/2331186X.2023.2232686>
- Fauzi, M. F., Anuar, T. S., Teh, L. K., Lim, W. F., James, R. J., Ahmad, R., Mohamed, M., Bakar, S. H. A., Yusof, F. Z. M., & Salleh, M. Z. (2021). Stress, anxiety and depression among a cohort of health sciences undergraduate students: the prevalence and risk factors. *International Journal of Environmental Research and Public Health*, 18(6), 1–14.
<https://doi.org/10.3390/ijerph18063269>
- Grupe, D. W., & Nitschke, J. B. (2013). Uncertainty and anticipation in anxiety: An integrated neurobiological and psychological perspective. *Nature Reviews Neuroscience*, 14(7), 488–501.
<https://doi.org/10.1038/nrn3524>
- Haruna, U., Mohammed, A. R., & Braimah, M. (2025). Understanding the burden of depression, anxiety and stress among first-year undergraduate students. *BMC Psychiatry*, 25(1), 1–9.
<https://doi.org/10.1186/s12888-025-07069-8>
- Jacobson, E. (1938). *Progressive relaxation*. University of Chicago Press.
- Jacob, S., & Sharma, S. (2018). Efficacy of progressive muscular relaxation on coping strategies and management of stress, anxiety and depression. *Int j Indian psychol*, 6(1), 106–124.
- January, J., Madhombiro, M., Chipamaunga, S., Ray, S., Chingono, A., & Abas, M. (2018). Prevalence of depression and anxiety among undergraduate university students in low- and middle-income countries: A systematic review protocol. *Systematic Reviews*, 7(57), 1–5.
<https://doi.org/10.1186/s13643-018-0723-8>
- Kandasamy, G., Almanasef, M., Almeleebia, T., Orayj, K., Shorog, E., Alshahrani, A. M., Khaled, A., Prabahar, K., Alqifari, S. F., Mani, V., Alsuheim, G. Y. A., Alahmari, W. M. D., Ahmed, R., & Paulsamy, P. (2025). Prevalence of anxiety and depression among university students in Southern Saudi Arabia based on a cross sectional survey. *Scientific Reports*, 15(1), 1–9.
<https://doi.org/10.1038/s41598-025-00695-y>
- Kazdin, A. E. (2007). Mediators and mechanisms of change in psychotherapy research. *Annual Review of Clinical Psychology*, 3, 1–27.
<https://doi.org/10.1146/annurev.clinpsy.3.022806.091432>

- Li, W., Zhao, Z., Chen, D., Peng, Y., & Lu, Z. (2022). Prevalence and associated factors of depression and anxiety symptoms among college students: a systematic review and meta-analysis. *Journal of Child Psychology and Psychiatry and Allied Disciplines*, 63(11), 1222–1230. <https://doi.org/10.1111/jcpp.13606>
- Liu, K., Chen, Y., Wu, D., Lin, R., Wang, Z., & Pan, L. (2020). Effects of progressive muscle relaxation on anxiety and sleep quality in patients with COVID-19. *Complementary therapies in clinical practice*, 39, 101132.
- Lovibond, P. F., & Lovibond, S. H. (1995). The Structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335–343. [https://doi.org/10.1016/0005-7967\(94\)00075-1](https://doi.org/10.1016/0005-7967(94)00075-1)
- Makara-Studzińska, M., Tyburski, E., Zatuski, M., Adamczyk, K., Mesterhazy, J., & Mesterhazy, A. (2022). Confirmatory factor analysis of three versions of the depression anxiety stress scale (DASS-42, DASS-21, and DASS-12) in Polish adults. *Frontiers in psychiatry*, 12, 770532.
- Muhammad Khir, S., Wan Mohd Yunus, W. M. A., Mahmud, N., Wang, R., Panatik, S. A., Mohd Sukor, M. S., & Nordin, N. A. (2024). Efficacy of Progressive Muscle Relaxation in Adults for Stress, Anxiety, and Depression: A Systematic Review. *Psychology Research and Behavior Management*, 17(January), 345–365. <https://doi.org/10.2147/PRBM.S437277>
- Nurmina, Fahrianti, F., Haryani, M., & Wahyuni, H. (2021). Depression, anxiety, and stress among first-year students and undergraduate students during the Covid-19 pandemic. *International Journal of Research in Counseling and Education*, 05(02), 206–214. <https://doi.org/10.24036/00453za0002>
- Othman, N., Ahmad, F., El Morr, C., & Ritvo, P. (2019). Perceived impact of contextual determinants on depression, anxiety and stress: A survey with university students. *International Journal of Mental Health Systems*, 13(17), 1–9. <https://doi.org/10.1186/s13033-019-0275-x>
- Raad, G., Tanios, J., Azoury, J., Daher, A., Fakhri, C., & Bakos, H. W. (2021). Neurophysiology of cognitive behavioural therapy, deep breathing and progressive muscle relaxation used in conjunction with ART treatments: a narrative review. *Human Reproduction Update*, 27(2), 324–338.
- Sulak, S. A., & Koklu, N. (2024). Analysis of Depression, Anxiety, Stress Scale (DASS-42) with methods of data mining. *European Journal of Education*, 59(4), e12778.
- Tyagi, V., Arora, N., Saran, B., & Debapriya. (2025). Academic stress and its clinical implications among college students. *International Journal of Research in Medical Sciences*, 13(10), 4206–4211. <https://doi.org/10.18203/2320-6012.ijrms20253166>
- Yu, Y., Yan, W., Yu, J., Xu, Y., Wang, D., & Wang, Y. (2022). Prevalence and associated factors of complains on depression, anxiety, and stress in university students: an extensive population-based survey in China. *Frontiers in Psychology*, 13(March), 1–11. <https://doi.org/10.3389/fpsyg.2022.842378>
- Yulina, E., Yunita, Y., Kesuma Dewi, I., & Gama Samudera Lubis, D. M. (2025). The relationship between academic stress and mental health Of Medan area university students. *Journal of Comprehensive Science*, 4(7), 2284–2291. <https://doi.org/10.59188/jcs.v4i7.3455>