BALNEO RESEARCH Balneo and PRM Research Journal English Edition
e ISSN 2734 - 8458 p ISSN 2734 - 844X ROMANIAN ASSOCIATION OF BALNEOLOGY

Research article

Application of Gymnastics Dang Lupa Komering in a Modern exercise Program to improve the physical fitness of adult women

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Citation: Sukmawati N., Oktariyana O., Haris I.N., Juliawati K., Aliriad H., Shah S.A. – Application of Gymnastics Dang Lupa Komering in a Modern exercise Program to improve the physical fitness of adult women
Balneo and PRM Research Journal ***2025****, 16(4): 915*

Academic Editor(s):
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Received: 29.10.2025
Published: 30.12.2025

Reviewers:
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Publisher's Note: Balneo and PRM Research Journal stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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Abstract: Physical fitness plays an important role in improving productivity and quality of life, as well as preventing non-communicable diseases, by strengthening the cardiorespiratory system and muscles, and improving mental health. This study aims to determine the effect of incorporating Dang Lupa Komering Gymnastics into modern exercise programmes on the physical fitness of adult women. The research method used was an experimental one with a one-group pretest-posttest design. The study sample comprised 30 adult women aged 25–45 years living in Ogan Komering Ulu Regency (OKU), South Sumatra. The intervention consisted of a warm-up, core exercises combining Dang Lupa Komering movements with modern aerobic exercises, and a cool-down, and was conducted for six weeks at a frequency of three times per week. Measure-ments were taken using the Indonesian Physical Fitness Test (TKJI) for adult women. Results from the paired sample t-test ($\alpha = 0.05$) revealed significant improvements in endurance (+9.3%), muscle strength (+12.1%), flexibility (+7.8%) and agility (+5.4%), all with $p < 0.05$. The size effect (Cohen's d) was in the medium-to-large category (0.39–0.88). In conclusion, incorpo-rating Dang Lupa Komering Gymnastics into modern exercise programmes effectively enhanc-es the physical fitness of adult women, fostering motivation and cultural engagement with physical activity.

Keywords: gymnastics, dang lupa komering, physical fitness, adult women, local culture, modern exercise program

1. Introduction

Physical fitness is important for increasing productivity and quality of life, as well as for preventing non-communicable diseases, by strengthening the cardiorespiratory system, muscles and mental health (Barranco-Ruiz & Villa-González, 2020; Oksanen et al., 2024; Wahl-Alexander, 2023). However, adult women in Indonesia still have low levels of physical activity due to sedentary lifestyles, high workloads, and a lack of motivation to exercise (Anggraini et al., 2022; Hutasuhut et al., 2020). Modern practice often ignores the socio-cultural and emotional aspects of participants, which reduces sustainability (Chen, 2023; Handayani & Komaini, 2021; Hižnayová, 2013).

Therefore, an exercise model is needed that fosters motivation and social engagement as well as being healthy (Aliriad, 2024).

One alternative is to adapt local movement cultures, such as the rhythmic, aerobic and expressive Dang Lupa Komering dance from South Sumatra (Helvana & Hidayat, 2020). Integrating local cultural values into fitness programmes has been shown to boost motivation and sense of community, as well as strengthening cultural identity (Aminah et al., 2022; Azmi et al., 2024). However, research into the potential of gymnastics based on local Indonesian culture, particularly, to improve the physical fitness of adult women is still very limited. Most previous studies have focused on children or adolescents, or have used traditional games to develop motor skills (Berloffa, 2022; Wang, 2024; Zhang et al., 2021). Consequently, research integrating local cultures to benefit adult women is rare.

This study is based on the theories of physical fitness and intrinsic motivation, as well as the concept of local cultural relevance. The hypothesis is that the Dang Lupa Komering gymnastics programme can improve the physical fitness of adult women, including their cardiorespiratory endurance, muscle strength, flexibility and balance. In addition to the physiological benefits, integrating local cultural elements is expected to boost participants' motivation and emotional engagement, encouraging continued participation. Movements are adapted by maintaining traditional rhythms and gestures, while being structured according to the principles of modern aerobic exercise, incorporating a warm-up, core, and cool-down routine. Exercise intensity is regulated through music tempo, movement amplitude, and low-impact cardio elements such as step-touch, step-hop, and rhythmic squats. This ensures that heart rate remains within the target exercise zone (50–85% HR_(max)) with RPE monitoring. This approach is expected to make the Komering culture-based gymnastics model an adaptive, effective and contextual form of exercise that supports the preservation of the community's culture and social identity.

Physical fitness is a multidimensional concept encompassing cardiorespiratory endurance, muscle strength, flexibility, balance and body composition (Ansari, 2025; Muryadi et al., 2022; Syahriadi et al., 2024). Rhythmic and coordinative movements have been shown to increase aerobic capacity and the efficiency of the neuromotor system simultaneously, making them effective in supporting overall fitness (Marsuna et al., 2024). Additionally, modern rhythmic gymnastics can help maintain health and reduce the risk of injury in adult women (Rani & Farhan, 2021). From a psychosocial perspective, the theory of intrinsic-extrinsic motivation asserts that physical activity is more sustainable when driven by intrinsic motivations such as pleasure and self-expression (O'Donnell, 2014; Patelia et al., 2021; Phansikar & Mullen, 2022). Meanwhile, social identity theory suggests that activities reflecting local culture can reinforce a sense of belonging and social connection (Darong, 2022; Fuadi, 2024). Therefore, incorporating cultural movements such as Dang Lupa Komering into fitness training provides physiological benefits and fosters participants' motivation and social connection.

This study is novel in its focus on productive adult women in the Komering cultural region, a group that has rarely been the subject of local, culture-based fitness research. In terms of methodology, the study involved the development of a Dang Lupa Komering gymnastics programme that incorporated modern aerobic exercise principles in a measured way (Jones et al., 2018; Saputra, 2024; Selcen & Metin, 2018). In terms of analysis, the study not only assessed physical components such as endurance, strength, flexibility and balance, but also psychosocial aspects such as motivation, cultural attachment and exercise sustainability (Nurhadi et al., 2023).

Dang Lupa Komering is not only a cultural aesthetic element, but also an active part of the exercise design process, combining local wisdom with a modern scientific

approach. This aligns with the concept of local wisdom-based learning, which emphasises social engagement and the sustainability of community fitness (Fathan et al., 2022; Rakhman et al., 2024) . In the long term, it is expected that this study will serve as a model for culture-based fitness interventions that can be applied and replicated in various regions of Indonesia. Although much of the literature has addressed culture-based fitness interventions, previous studies have mostly focused on young or elderly women, particularly those facing the challenges of sedentary lifestyles and high occupational pressures (Jeong, 2025).

Furthermore, past studies have rarely integrated local cultural movements with the principles of structured, measured modern aerobic exercise. Most studies have only focused on the physical aspects, failing to examine psychosocial factors such as intrinsic motivation, cultural attachment and the sustainability of participation. These factors actually have a significant impact on exercise consistency (Kim, 2023; Nam et al., 2023).

In light of these gaps, this study proposes a novel approach: the development and testing of a gymnastics programme combining the Komering culture movement (Dang Lupa Komering) with modern aerobic exercise principles. This approach assesses the physiological, psychological, and cultural dimensions of participants, resulting in an integrative, contextual, and sustainable exercise model for promoting physical fitness based on local Indonesian culture.

This study examined the effect of Dang Lupa Komering gymnastics on improving the physical fitness of adult women in the Komering culture region, focusing on changes in cardiorespiratory endurance, muscle strength, flexibility, and balance following the intervention. Additionally, the study evaluated psychosocial variables such as intrinsic motivation, cultural attachment, and exercise sustainability. Furthermore, the study aimed to develop an adaptive, sustainable, local culture-based fitness exercise model to improve public health, preserve traditional culture, and strengthen community social identity.

2. Materials and Methods

Research Design

This study uses a quantitative experimental method with a one-group pretest–posttest design, described as $O_1 - X - O_2$. In this design, O_1 shows the results of a fitness test before treatment; X shows the application of exercise programmes using Gymnastics Dang Lupa Komering; and O_2 shows the results of a fitness test after treatment (Achen, 2023).

This design has methodological limitations because it does not involve a control group. This means that any changes occurring after treatment cannot be conclusively linked to the administered intervention. The absence of a comparison group means that the influence of external factors that cannot be controlled, such as motivation and additional physical activity, as well as natural changes in the participants' condition, cannot be ruled out. Additionally, this design is susceptible to the testing effect, whereby participants may perform better in the post-test due to their familiarity with the instruments used in the pre-test. Improvements in fitness can also occur over time without intervention, which is another potential source of bias.

Subjects of study

The study involved 30 adult women, aged 25–45, who were selected based on specific inclusion and exclusion criteria. The inclusion criteria were: (1) residence in Ogan Komering Ulu, South Sumatra; (2) good physical health, as indicated by an absence of medical restrictions on moderate-intensity exercise; (3) no history of chronic diseases, such as cardiovascular disorders, diabetes or musculoskeletal conditions; and

(4) willingness to participate in a structured six-week exercise programme. The exclusion criteria included: (1) pregnancy or the postpartum period; (2) participation in other structured fitness programmes at the time of the study; (3) physical limitations or injuries that could interfere with exercise performance; and (4) an inability to commit to regular attendance during the intervention period. The study was conducted in Ogan Komering Ulu to support the authenticity of the cultural context, as this is where the Dang Lupa Komering tradition originates.

Treatment Procedure

The exercise Program was carried out for 6 weeks with a frequency of three sessions each week, where each session lasted for approximately 50 minutes. During the period, participants follow a series of gymnastics Dang Lupa Komering that has been prepared based on the principles of modern aerobic exercise and adapted to the physical abilities of adult women, so that it is expected to provide an increase in physical fitness optimally (Ciccone et al., 2018; Sanny et al., 2023; Wen & Tsai, 2020).

Table 1. Details Of The Exercise Intensity

Week	Session duration (minutes)	Intensity (Heart Rate Zone)*	Target % HRmax	RPE (Borg Scale 6–20)	Progression Focus
1	30	Light Zone	50–60% HRmax	9–11 (*Light effort*)	Adaptation of movements, basic coordination
2	35	Light–Medium Zone	55–65% HRmax	10–12	Increase the comfort of the rhythm of movement
3	40	Medium Zone	60–70% HRmax	12–13 (*Somewhat hard*)	Tempo increase and technical errors corrected
4	45	Medium–Moderately Heavy Zone	65–75% HRmax	13–14	Duration and intensity of choreography
5	45	Rather Heavy Zone	70–80% HRmax	14–15 (*Hard*)	Movement variations for aerobic capacity improvement
6	50	Medium–Heavy Zone	75–85% HRmax	15–16	Maximum intensity controlled prior to evaluation

Research Instruments

This study uses the Indonesian Physical Fitness Test (TKJI), which has been adapted for adult women, as the measuring instrument. The test covers five main components of physical fitness: endurance, muscle strength, flexibility, agility and body composition. The specific types of tests and units used to measure each component are shown below:

Table 2. Indonesian physical fitness test (TKJI)

Components	Types Of Tests	Unit
Durability	Run in place 3 minutes	pulse rate/min
Muscle strength	Sit-ups 60 seconds	total
Malleability	Sit and reach	cm
Agility	Shuttle run	seconds
Body composition	BMI	kg / m2

Paired sample t-tests were used to analyse pre-test and post-test data with a significance level of 0.05, to determine significant differences between conditions before and after treatment. Additionally, the influence of the Dang Lupa Komering gymnastics programme on improving physical fitness was assessed by calculating the effect size using Cohen's d, which is used to interpret the strength of the effect of exercise. The categories are small ($d < 0.2$), medium ($0.2 \leq d < 0.8$) and large ($d \geq 0.8$).

2. Results

The results of measuring the level of physical fitness of adult female participants before (pretest) and after (posttest) following a physical exercise program that has been designed are presented in Table 3. Parameters measured include BPM (pulse rate per minute) as an indicator of heart-lung endurance (endurance), muscle strength (strength), flexibility (malleability/flexibility), agility (agility), and body mass index (BMI).

Table 3. Average Adult female physical fitness Pretest and Postes results

	BPM endurance		Strength		Malleability		Agility		BMI	
N	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
30	410.4	561.09	528	608	75.5	82.3	13.00	12.03	26.50	26.04

Table 4. Average Absolute change (ABS) and percentage change (PCT) of adult female physical fitness

	BPM endurance		Strength		Malleability		Agility		BMI	
N	Abs	Pct	Abs	Pct	Abs	Pct	Abs	Pct	Abs	Pct
30	-10	-11,66	3,33	4,92	0,07	1,45	-0,48	-5,22	0,006	0,025

Changes in BMI following the intervention revealed a slight decrease in most participants, though this was not significant enough to alter their weight category. These findings are consistent with the understanding that BMI is not sensitive to changes in body composition over relatively short periods of exercise. Therefore, the BMI results in this study should be interpreted with caution and should not form the sole basis for evaluating the effectiveness of the intervention. Subsequent studies should use additional indicators, such as body fat percentage, waist circumference, waist-hip ratio (WHR) or bioimpedance analysis, to measure changes in body composition more accurately.

Table 5. T-test analysis: pretest, posttest, fitness components.

Fitness Components	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	% Changes	t-count	p-value	Description	Cohen's d
Endurance (pulse)	128.4 ± 89	116.5 ± 7.2	+9.3%	5.47	0.0001	Significant	0.88
Muscle strength (sit-ups)	22.8 ± 3.7	25.6 ± 3.2	+12.1%	4.65	0.001	Significant	0.75
Malleability (cm)	25.2 ± 5.4	27.2 ± 5.1	+7.8%	2.12	0.044	Significant	0.39
Agility (seconds)	12.6 ± 0.9	11.9 ± 0.8	+5.4%	3.23	0.005	Significant	0.62
Weight (kg / m2)	27.1 ± 2.3	26.6 ± 2.1	-1.8%	1.12	0.27	Not significant	0.21

The results of the analysis showed a significant improvement in almost all components of physical fitness following the exercise programme. Endurance (BPM) decreased from 128.4 ° 8.9 to 116.5 ° 7.2 (a 9.3% increase; p=0.0001), indicating an improvement in heart-lung function. Muscle strength increased from 22.8 ° 3.7 to 25.6 ° 3.2 (+12.1%; p = 0.001) and flexibility improved by 7.8% (p = 0.044), increasing from 25.2 ° 5.4 to 27.2 ° 5.1. Agility also improved, increasing from 12.6 ° 0.9 to 11.9 ° 0.8 (+5.4%; p = 0.005). Meanwhile, body mass index (BMI) decreased from 27.1 ± 2.3 to 26.6 ± 2.1 (-1.8%), though this change was not statistically significant (p = 0.27). Overall, the programme was shown to effectively increase the endurance, strength, flexibility and agility of adult women, although it did not significantly affect BMI. Overall effect cohen's size range: *0.39–0.88* (medium-to-large).

Table 6. Pearson correlation analysis (r) between variables

Variable Relationship	(r)	p-value	Interpretation
Malleability up ↔ Durability up	**0.62**	0.001	Strong positive correlation — the more pliable, the better the durability
Strength up ↔ Endurance up	**0.58**	0.002	Medium-strong positive correlation
Agility up ↔ Endurance up	**-0.55**	0.004	Moderate negative correlation (the faster the time, the better the endurance)
Malleability up ↔ Strength up	**0.44**	0.015	Moderate positive correlation
BMI down ↔ Endurance up	**-0.31**	0.087	Weak correlation, insignificant

Correlation analysis revealed a strong positive relationship between increased flexibility and endurance (r = 0.62, p < 0.01). This indicates that greater flexibility is associated with improved heart-lung capacity. This illustrates that good muscle flexibility enables more efficient movement and optimal energy use during aerobic activity. A moderate correlation between muscle strength and endurance (r = 0.58) suggests that the anaerobic component also contributes to aerobic performance. Conversely, the negative correlation between agility (shuttle run time) and endurance (r = -0.55) indicates that faster reaction times and better coordination lead to a more efficient energy system.

Table 7. Participant perception analysis (motivation & satisfaction) Likert scale questionnaire 1-5

Aspects Of Perception	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	% Changes	p-value	Description
Motivation to follow training	3.2 ± 0.7	4.6 ± 0.5	+43.7%	0.000	Very significant
Enthusiasm for Komering music	3.5 ± 0.6	4.8 ± 0.4	+37.1%	0.000	Very significant
Comfort during exercise	3.8 ± 0.8	4.7 ± 0.5	+23.7%	0.002	Significant
Pride in local culture	3.6 ± 0.7	4.9 ± 0.3	+36.1%	0.000	Very significant

Psychologically, there was a significant increase in exercise motivation (from 3.2 to 4.6/5), enthusiasm for Komering music and pride in local culture. This suggests that incorporating cultural elements into physical exercise improves not only physical fitness, but also evokes positive emotions and a sense of cultural identity among participants.

Table 8. Instrument Reliability Test

Instruments	Item	Cronbach's α	Criteria	Interpretation
Participant perception questionnaire	8	**0.88**	> 0.8	Excellent reliability
Physical fitness test (TKJI)	5	**0.83**	> 0.8	Reliable
Participatory observation	4	**0.79**	≈ 0.8	Quite reliable

A reliability test using Cronbach's α showed that the measuring instrument has a high internal consistency: α = 0.88 for the questionnaire and α = 0.83 for the fitness test. This means that each measurement item can reliably describe the same construct. High reliability reinforces the validity of the findings, ensuring that the results obtained are not solely the result of variations in the measurements taken.

3. Discussion

This study demonstrates that a specific exercise programme can improve various aspects of physical fitness, including endurance, muscle strength, flexibility and agility. However, the study has some significant methodological limitations. The absence of a control group means that it is difficult to ascertain whether the changes that occur are entirely due to the intervention. Additionally, the programme protocols are not described in detail, including the intensity of the exercises and the mechanisms for monitoring participant compliance, which may affect the consistency and replicability of the results. The psychosocial instruments used have not undergone rigorous validation, so the results regarding participants' perceptions must be interpreted with caution. Given the relatively short duration of the programme and the fact that changes in body composition often require longer interventions and tighter control over diet, an explanation of the insignificance of BMI changes is acceptable.

Physical fitness is an important indicator of health. According to the World Health Organization (Chaput et al., 2020), regular physical activity significantly reduces the risk of non-communicable diseases such as heart disease, type 2 diabetes, hypertension and obesity. A person with a high level of physical fitness generally has optimally functioning cardiovascular, musculoskeletal, and metabolic systems. This study focuses on the issue of low physical activity and fitness levels among adult women in Indonesia, particularly in areas where sedentary lifestyles are prevalent. This has an impact on cardiorespiratory capacity, muscle strength, and body balance (Alfatah et al., 2024). Culture-based fitness approaches such as Dang Lupa Komering calisthenics are an attractive alternative because they improve physical function and incorporate social, emotional, and cultural elements that reinforce the motivation to exercise and ensure its long-term sustainability (Aliriad et al., 2023).

The results showed that the participants' physical fitness improved significantly after they followed the exercise programme, with improvements seen in several components, such as heart-lung endurance, muscle strength, flexibility and agility. A decrease in pulse rate (beats per minute, BPM) indicates an increase in cardiorespiratory endurance. This finding aligns with the results of research by Burhan et al., (2024), which proves that structured gymnastics can significantly improve participants' physical fitness. According to Gaspari et al., (2024) principles of Modern Fitness, the rhythmic movement of Dang Lupa Komering Gymnastics combines elements of coordination, balance and aerobic activity. Moderate-intensity rhythmic exercises are said to improve cardiac endurance, muscle strength and neuromotor coordination. The American College of Sports Medicine Hunter et al., (2023) states that this reflects the efficiency with

which the heart and lungs deliver oxygen to body tissues during physical activity. Increased endurance is directly related to a reduced risk of cardiovascular disease and an improved quality of life.

Increased muscle strength and flexibility also have positive health implications. Good muscle strength helps to maintain lean muscle mass, supports joint function, and prevents injuries and musculoskeletal disorders(Marconcin et al., 2023; Ring, 2022). Meanwhile, increased flexibility improves range of motion and enables more efficient movement, which is important for maintaining good posture and preventing chronic musculoskeletal pain. Additionally, increased agility indicates improved coordination and balance. According to Ko & Yu, (2022), good neuromuscular ability is important for performing daily activities and can reduce the risk of falls, particularly among adults and the elderly. However, insignificant changes in body mass index (BMI) suggest that exercise programmes may be too short to produce noticeable changes in body composition. Nevertheless, a stable BMI indicates effective weight management and helps to prevent obesity and metabolic disorders.

Overall, the results of this study confirm that regular, structured physical exercise improves various components of physical fitness and supports overall health. This aligns with the Puspodari et al., (2022) and Saygin et al., (2016) recommendation of 150–300 minutes of moderate-intensity aerobic physical activity combined with muscle-strengthening activity at least twice weekly to achieve optimal health benefits. However, the study also showed that there were no significant changes in body composition (BMI). This was probably due to the exercise programme being relatively short and the participants' diet not being controlled. This finding aligns with that of Kafrawi et al., (2025), who state that changes in body composition require longer intervention periods and consistent energy regulation.

Participation in the Dang Lupa Komering gymnastics programme increased intrinsic motivation and a sense of community, as well as improving psychosocial well-being. Culture-based activities like this can strengthen social identity and a sense of belonging to the community. As explained by (Lindsay-Smith et al., 2018), social attachment through culturally based group activities contributes to improved psychological well-being and long-term participation. The local, wisdom-based fitness approach also aligns with the concepts of contextual learning and cultural value reinforcement (Haugland et al., 2024; Oliveira & Brito, 2023). They argue that incorporating cultural elements into physical education activities fosters social involvement and cultural preservation, thereby increasing community participation and motivation. Thus, Dang Lupa Komering Gymnastics serves not only as a form of physical activity, but also as an educational and social means of strengthening the character and identity of the local culture.

Nevertheless, the study was limited in terms of sample size and the duration of the exercise. Further studies with randomised experimental designs, longer intervention periods and dietary controls are recommended to gain a deeper understanding of the long-term effects of culture-based gymnastics on fitness and psychological well-being. In practical terms, the results of this study reinforce the idea that developing local, culture-based fitness programmes could be an innovative public health strategy. Programmes such as Senam Dang Lupa Komering could be implemented in various regions of Indonesia to improve physical fitness while preserving cultural heritage, in line with the objectives of character and contextual physical learning.

5. Conclusions

Gymnastics Dang Lupa Komering is an effective way to improve the physical fitness of adult women, particularly in terms of endurance, strength, flexibility and agility. It also has a positive psychological impact, increasing motivation and cultural pride.

The interrelation between physical variables and psychological factors confirms that locally based cultural exercise has great potential as a means of promoting fitness and preserving Indonesian cultural heritage.The Dang Lupa Komering gymnastics programme demonstrates that a culture-based exercise approach can unite physical, psychological and cultural aspects in an effective programme. This programme could be used as a model for developing modern traditional gymnastics, improving the fitness of the Indonesian population while maintaining local cultural values. Furthermore, the results of this study suggest the potential for applying similar models to other age groups and populations. Integrating local culture into modern sports could be an innovative strategy for health promotion based on local wisdom.

Author Contributions: Conceptualization, A.S. and Z.A.; methodology, A.S. ; software, Z.A. and S.S. ; validation, N.H. and Z.A.A.; formal analysis, T.T.; investigation, M.L.; resources, A.S. ; data curation, S.S. ; writing—original draft preparation, Z.A.A.; writing— review and editing, M.L. and T.T. ; visualization, Z.A.A.; supervision, M.L.; project administration, A.S.; funding acquisition, A.S. All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest: The authors declare no conflict of interest

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