










RESEARCH ARTICLE

## Effectiveness of The Sumatera Selatan Bersatu Gymnastics Model in the Improvement of Students' Physical Fitness

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### Abstract

The aim of this study was to improve the physical fitness of students at Bina Darma University in Palembang. The South Sumatera Bersatu gymnastics model was identified as one of the potential methods to improve students' physical fitness. The purpose of this study was to analyse the effectiveness of using the South Sumatera Bersatu Gymnastics Model in improving the physical fitness of students. The scope of the study included students with an average age of 19 years. The method used in this study is an experiment with a group pre-test and post-test design. The research sample was taken through purposive sampling with an age criterion of 19 years. The intervention in the form of implementing the Bersatu Sumatera Selatan Bersatu model was carried out for 8 sessions in each session doing 5 repetitions. Physical fitness data were collected before and after the intervention using the Indonesian Physical Fitness Test. The results showed that the use of the South Sumatra Selatan Gymnastics Model significantly improved physical fitness. The resulting t-scores (a total of 41,583 for the pre-test and 64,673 for the post-test) indicate that these differences are highly statistically significant, with p-values (Sig.) that are extremely low ( $p < 0.000$ ). There was a significant improvement in various physical fitness indicators such as muscle strength, flexibility, endurance and speed after the students enrolled in the gymnastics programme. The conclusion South Sumatera Bersatu gymnastics model is effective in improving the physical fitness of students in Palembang. This research suggests that this gymnastics model could be adopted as part of physical education programmes in schools to improve students' health and fitness.

### Keywords

Effectiveness, Gymnastics model, Sumatra Selatan Bersatu, Physical Fitness, Student

## INTRODUCTION

Physical fitness is one of the important aspects in supporting students' physical and mental health, which directly affects their learning ability and academic performance (Ellyas et al., 2023; Harvianto & Bernisa, 2019; Muslimin et al., 2022). Students who have a good level of physical fitness tend to have higher stamina, better

concentration and the ability to participate actively in classroom activities (Daulay et al., 2023; Rizki et al., 2023). Bina Darma University students have a low level of physical fitness in sports activities.

Data from various health surveys show that many students are less physically active, which can have a negative impact on their overall health. Therefore, efforts are needed to improve the physical fitness of students through effective and

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enjoyable methods. One of the efforts that can be made is to apply the appropriate and effective gymnastics model. The gymnastics model of South Sumatera Bersatu was identified as a potential method to achieve this goal, given the local culture and characteristics contained in its movements.

Physical fitness is the ability of a person to perform daily activities efficiently and without excessive fatigue, and to have reserve energy for additional activities (Hadi et al., 2023; Meka et al., 2023; Mosteoru et al., 2023). The importance of physical fitness encompasses not only physical aspects, but also mental and emotional health, with a significant impact on the prevention of chronic diseases such as obesity, diabetes, heart disease and hypertension (Belli et al., 2022; Henriana, 2023). Good physical fitness can improve cardiovascular endurance, muscle strength, flexibility and healthy body composition (Ahn et al., 2024; Duncan et al., 2021; Helper et al., 2024). Physical fitness is very important for students because it has a positive impact on academic performance and mental health. Regular physical activity can improve concentration, memory and learning ability, which overall helps to improve academic performance. (Kavanagh et al., 2023; Makaruk et al., 2023; Vibarel-Rebot et al., 2023). Physical fitness also helps develop discipline, teamwork and self-confidence, which are important skills in everyday life (Cao et al., 2024; Liu et al., 2024; Morais et al., 2024).

Previous studies have shown that different types of exercise and physical activity can make a significant contribution to improving physical fitness (Honrubia-Montesinos et al., 2021; Ribeiro et al., 2024). Previous studies have looked at the relationship between physical fitness and body weight in primary school children and found that weight gain led to a decrease in physical fitness, especially in children with higher body weights (Aliriad, Adi, et al., 2023). To investigate the relationship between moderate-to-vigorous physical activity and health-related physical fitness indicators in adolescents aged 12-16 years in southern Punjab, Pakistan. The results showed a positive relationship between physical activity and indicators of hand grip strength, modified pull-ups, plank exercises and 20m shuttle run tests, indicating that increased fitness can improve body composition, muscle strength, core muscle endurance and aerobic capacity in both sexes. (Hamdani et al., 2023).

Research on the influence of the kindergarten environment on the physical development of pre-school children shows that kindergartens that provide physical education and special gyms have better physical fitness scores (Aliriad, Da'i, et al., 2023; Satria et al., 2023). The study also found that teachers' professional qualifications and participation in physical education are important factors in children's physical development. Research on aerobic exercise, yoga and floor exercise programmes has been shown to improve muscle strength, flexibility, endurance and other components of fitness (Field, 2016; Zhang et al., 2024). However, each type of exercise has different characteristics and effectiveness depending on the target group and the conditions under which it is delivered. Some studies suggest that a gymnastics programme that is structured and tailored to the needs and characteristics of the participants can produce more optimal results. However, specific studies evaluating the effectiveness of the Bersatu Sumatera Selatan Bersatu model are still limited. The lack of in-depth research on the effectiveness of this gymnastics model indicates the need for further studies to ensure that this model can be widely applied and provide maximum benefits.

This study aims to evaluate the effectiveness of the South Sumatera Bersatu Gymnastics Model in improving physical fitness among students of Bina Darma University Palembang. The benefits of research for students can improve physical fitness through the application of the South Sumatra Bersatu Gymnastics Model, as well as motivate them to exercise regularly. Thus, physical fitness not only supports physical health, but also provides holistic benefits for individual development, especially for students who are at an important stage of growth and development.

## MATERIALS AND METHODS

### *Participant*

This study uses experimental methods with a group pre-test and post-test design (Darwin et al., 2021; Syahrizal & Jailani, 2023). The respondent in this study was a 19-year-old student of Bina Darma University Palembang. The respondents were selected based on their willingness to participate in the gymnastics programme during the study period. A total of 25 students participated in this study.

Ethics Committee approval required This article was approved by the Ethics Committee of Health Research Islamic Hospital Malang, Malang City, East Java, Indonesia with number (No.106/KEPK/RSI-U/VII/2024). Participants provide informed consent with a volunteer form that includes details about the research, risks, benefits,

**Data Collection Tools**

The data collection procedure was carried out in several stages as follows:

**Pre-Test**

Before the gymnastics intervention, all respondents measured their physical fitness using the Indonesian Physical Fitness Test (TKJI), which consisted of a 60-metre sprint test, a 60-second body lift hanging test, a 60-second sitting lying test, an upright jump test, and a 1200-metre running test.

**Gymnastics Intervention**

Then the respondents followed the gymnastics model programme of South Sumatera

confidentiality and rights of participants. The study will strictly adhere to all the principles contained in the WHO Ethical Guidelines 2011 and CIOMS 2016, prioritising the rights and well-being of participants in the design, procedures and confidentiality measures.

Bersatu for 8 weeks, with a frequency of 2 times per week. Gymnastics activities used are Gymnastics South Sumatra United with a duration of 8 minutes and performed for 5 repetitions in each session of the exercise programme.

**Post-Test**

After 8 weeks, all respondents underwent physical fitness tests, namely 60-metre sprint test, 60-second body lift hanging test, 60-second sitting lying test, upright jump test, 1200-metre running test.

**Table 1.** Research participants

Sample	Age (years)	Height (cm)	Weight (kg)	Gender	IMT
1	19	168	70	Male	24.8 (Normal)
2	19	170	68	Male	23.5 (Normal)
3	19	172	72	Male	24.3 (Normal)
4	19	167	67	Male	24.0 (Normal)
5	19	169	71	Male	24.8 (Normal)
6	19	171	69	Male	23.6 (Normal)
7	19	173	73	Male	24.4 (Normal)
8	19	166	66	Male	23.9 (Normal)
9	19	168	70	Male	24.8 (Normal)
10	19	170	68	Male	23.5 (Normal)
11	19	172	72	Male	24.3 (Normal)
12	19	167	67	Male	24.0 (Normal)
13	19	169	71	Male	24.8 (Normal)
14	19	171	69	Male	23.6 (Normal)
15	19	173	73	Male	24.4 (Normal)
16	19	166	66	Male	23.9 (Normal)
17	19	168	70	Male	24.8 (Normal)
18	19	170	68	Male	23.5 (Normal)
19	19	172	72	Male	24.3 (Normal)
20	19	167	67	Male	24.0 (Normal)
21	19	169	71	Male	24.8 (Normal)
22	19	171	69	Male	23.6 (Normal)
23	19	173	73	Male	24.4 (Normal)
24	19	166	66	Male	23.9 (Normal)
25	19	168	70	Male	24.8 (Normal)

The table shows data from 25 samples of 19-year-old men. Each sample was between 166 cm and 173 cm tall and weighed between 66 kg and 73 kg. All Body Mass Index (BMI) values, calculated using the formula BMI = Weight (kg) / (Height (m)

- Height (m)), were within the normal range of 23.5 to 24.8, indicating that all samples had a healthy weight for their height. This table provides a comprehensive overview of the physical characteristics of the sample studied.

**Table 2.** Indonesian physical fitness test program for 8 weeks

Types of tests	Description	Aim
60 metre sprint test	Competitors run 60 metres as fast as possible.	To assess speed and explosive power.
60 Second Body Lift Hanging Test	Participants hang from the horizontal bar and lift their bodies up and down for 60 seconds.	To assess the strength and endurance of the arm and shoulder muscles.
60 second sit test	Participants lie down and sit down as much as possible within 60 seconds.	To measure abdominal strength and endurance and waist flexibility.
Standing Jump Test	Participants jump as high as possible from a standing position and measure the height of the jump.	Assesses limb muscle strength and vertical explosive power.
1200 metre run test	Competitors run 1200 metres at their best speed.	Measures cardiovascular and aerobic endurance.

**Table 3.** Indonesian physical fitness test

Value	60 metre sprint test (A)	60 Second Body Lift Hanging Test (B)	60 second sit test (C)	Standing Jump Test (D)	1200 metre run test (E)
5	S.d – 7,2"	19 - Up	41 - Up	73 - Up	s.d – 3'14"
4	7.3" – 8,3"	14 – 18	30 – 40	60 – 72	3'15" – 4'25"
3	8,4" – 9,6"	9 – 13	21 – 29	50 – 59	4'26" – 5'12"
2	9,7" – 11,0"	5 – 8	10 – 20	39 – 49	5'13" – 6'33"
1	11,1" dst	0 - 4	0 – 9	38 dst	6'34" dst

**Table 4.** Classification assessment norms of physical freshness

No	Total Value	Classification Of Physical Freshness
1	22-25	Very good (BS)
2	18-21	Good (B)
3	14-17	Medium (S)
4	10-13	Less (K)
5	5-9	Less than a minute (s)

### Statistical Treatments

The data collected from the physical fitness test were analysed using SPSS 23 software. Data analysis was performed using t-test. The significance level was determined as  $p \leq 0.05$ .

## RESULTS

This study uses two stages of testing, namely pre-test and post-test, to evaluate the effectiveness of the Gymnastics Model of Sumatra Selatan Bersatu in improving the physical fitness of students at Universitas Bina Darma. In the pre-test phase, students underwent a series of fitness tests covering five categories: a 60-metre run to measure speed, a 60-second body lift hanging test to measure arm muscle strength and upper body endurance, a lying down test to measure abdominal muscle strength, an upright jump to measure explosive leg strength, and a 1200-metre run to test cardiovascular endurance. These pre-test results are

used as a baseline to compare changes in physical fitness after an exercise programme.

After the pre-test, the students undergo the South Sumatera Bersatu Gymnastics Model exercise programme, which is designed to improve overall fitness through strength, flexibility and endurance training. After completing the exercise programme, a post-test is conducted using the same tests as the pre-test to assess the improvement in physical fitness. The post-test results showed a significant improvement compared to the pre-test, with the average score increasing from around 15.0 to 20.0. Statistical analysis using the t-test showed a very high t-value and a low level of significance (Sig. 0.000), indicating that the difference between the pre-test and post-test scores did not occur by chance.

This study aims to evaluate the effectiveness of the Sumatera Selatan Bersatu Gymnastics Model in improving physical fitness among students of Bina Darma University Palembang.

Physical fitness data collected from pre-test and post-test were analysed using t-test to compare the results between pre-test and post-test groups. The physical fitness table of Bina Darma University students in Table 5. shows the results of pretest and posttest scores of 25 samples. In the pretest stage, the scores given include five categories: 60 metre run (A), 60 second body lift hanging test (B), lying down (C), jumping upright (D) and 1200 metre run (E). Pretest scores range from 13 to 20, with most scores between 13 and 18. The post-test scores also

cover the same five categories, with the lowest score being 18 and the highest being 23. Most post-test scores range from 18 to 22. There was a significant increase in physical fitness scores after the post-test, with an average pre-test score of around 15.0 and an average post-test score of around 20.0. Overall, there was a consistent improvement from pretest to posttest scores in most samples, indicating an improvement in the physical fitness of the students after the exercise programme.

**Table 5.** Results of pre-test and post-test Physical Fitness

Category	Pre-test	Pre-test	Post-test	Post-test
Very Good	0	0%	7	28%
Good	4	16%	18	72%
Medium	18	72%	0	0%
Less	3	12%	0	0%
Less Than Once	0	0%	0	0%

**Table 6.** Descriptive analysis of pre-test and post-test physical fitness

Sample	Pretest					Total	Classification	Posttest					Total	Classification
	A	B	C	D	E			A	B	C	D	E		
1	3	2	3	2	3	13	Less	4	3	4	3	4	18	Good
2	2	2	4	3	3	14	Medium	4	3	4	4	4	19	Good
3	3	3	4	4	4	18	Good	5	4	5	3	5	22	Very Good
4	2	3	3	3	4	15	Medium	4	4	4	3	4	19	Good
5	3	2	3	2	3	13	Less	5	3	5	4	4	21	Good
6	3	3	4	2	3	15	Medium	4	4	3	3	5	19	Good
7	3	2	3	3	4	15	Medium	4	3	4	4	4	19	Good
8	4	3	3	2	3	15	Medium	5	3	5	3	5	21	Good
9	3	3	4	3	3	16	Medium	4	4	3	4	4	19	Good
10	4	4	4	4	4	20	Good	5	5	4	3	5	22	Very Good
11	3	4	3	3	4	17	Medium	4	5	4	5	4	22	Very Good
12	4	3	3	2	3	15	Medium	4	3	4	4	4	19	Good
13	2	3	4	2	3	14	Medium	4	4	3	4	5	20	Good
14	3	3	3	3	4	16	Medium	4	4	3	4	4	19	Good
15	3	2	3	2	4	14	Medium	4	4	4	3	4	19	Good
16	2	2	4	3	3	14	Medium	5	5	3	5	4	22	Very Good
17	2	3	4	4	3	16	Medium	4	4	3	4	3	18	Good
18	3	2	3	3	4	15	Medium	4	3	4	3	4	18	Good
19	3	2	3	2	3	13	Less	4	4	4	3	4	19	Good
20	4	3	3	2	3	15	Medium	3	5	3	5	3	19	Good
21	4	4	4	3	4	19	Good	5	4	5	5	3	22	Very Good
22	3	3	4	4	4	18	Good	5	3	5	4	5	22	Very Good
23	3	2	3	3	3	14	Medium	5	4	5	4	5	23	Very Good
24	4	2	3	2	3	14	Medium	5	4	4	5	3	21	Good
25	3	3	4	2	3	15	Medium	5	3	4	3	5	20	Good

**Tabel 7.** One-sample statistics

	N	Mean	Std. Deviation	Std. Error Mean
Pretest	25	15.3200	1.84210	.36842
Posttest	25	20.0800	1.55242	.31048



**Tabel 8.** One-sample test

	t	df	Sig. (2-tailed)	Mean Difference	Test Value = 0	
					95% Confidence Interval of the Difference	
					Lower	Upper
Pretest	41.583	24	.000	15.32000	14.5596	16.0804
Posttest	64.673	24	.000	20.08000	19.4392	20.7208

The test results of one sample showed a comparison between the pretest and posttest scores with a test value of 0. On the pretest, the value of t is 41.583 with degrees of freedom (df) 24, significance (Sig. 2-tailed) 0.000 and mean difference 15.32000. The 95% confidence interval of this difference is between 14.5596 and 16.0804. In the post-test, the value of t is 64.673 with degrees of freedom (df) 24, significance (Sig. 2-tailed) 0.000 and mean difference 20.08000. The 95% confidence interval of this difference is between 19.4392 and 20.7208. These results show that there is a significant difference between the pretest and posttest scores, with a high t-value and very low significance (0.000) indicating that this difference does not occur by chance. The mean difference on the post-test is higher than that on the pre-test, indicating a significant increase in the post-test score.

## DISCUSSION

Gymnastics South Sumatra Bersatu, as a form of local intervention, can have a significant positive impact on the physical fitness of students. The results of the study provide new insights into the effectiveness of local culture-based exercise programmes at Bina Darama University, Palembang, Indonesia. Physical activity that is structured and adapted to the local cultural context may be more acceptable and effective in improving the physical health of participants. Approaches that take into account cultural and social aspects can increase participants' involvement in improving physical fitness.

Overall, these findings reinforce the understanding that exercise programmes based on the local culture of Senam Sumatera Bersatu can be an effective tool for improving physical fitness. The results also emphasise the integration of cultural aspects in the design of health and wellness

programmes, which can lead to better participation and more optimal outcomes. The level of physical fitness, frequency of exercise and physical injuries have a significant impact on the fitness of Bina Darma University students. These findings suggest that higher education institutions and sports departments should pay more attention to these factors in order to improve the overall physical fitness of society. Concrete steps that can be taken include the provision of adequate sports facilities, the promotion of active lifestyles and injury prevention counselling.

His other research has shown that physical fitness in men is influenced by socio-economic factors, whereas in women it is influenced by natural environmental factors (Gericke et al., 2024; Monyeki et al., 2024; Peterson et al., 2024). Longitudinal studies show that physical fitness, specifically coordination and muscle fitness, can predict self-rated health in adolescents and young adults (Deng et al., 2024; Fridolfsson et al., 2024; Stanković et al., 2023). These findings suggest that interventions aimed at improving these aspects of physical fitness may have long-term beneficial effects on individual health. Therefore, programmes aimed at improving coordination and muscle fitness in adolescents need to be widely developed and implemented.

The results of the various studies mentioned above show that physical fitness is not influenced by a single factor, but is the result of a complex interaction of various social, economic, environmental and technological factors (Hackett et al., 2024; Towns et al., 2024). This highlights the need for a multidisciplinary and holistic approach to improving the physical fitness of adolescents and the general population. However, the implementation of an effective strategy requires strong support and commitment from various parties, including governments, educational institutions and communities. Using the natural environment in regional physical fitness strategies can support access to safe and affordable green spaces and sports facilities.

On the other hand, the increasing use of technology, especially the Internet, as a tool to promote physical fitness requires the development of intuitive and inclusive digital platforms (Bazalo et al., 2024; Kisiel-Sekura et al., 2024; Lewandowski et al., 2024). An intelligent and digital sports public service system must be designed with different demographics and specific needs in mind. The development of the Global Observatory on Physical Fitness as a global coordination and monitoring centre is an essential step in addressing the lack of fitness priorities in the public health agenda to support more effective policies and programmes in different countries.

### Conclusions

Gymnastics South Sumatra Bersatu as a form of local intervention, can have a significant positive impact on the physical fitness of students. This provides new insights into the effectiveness of local culture-based training programs in the context of higher education in Indonesia. This study confirms that physical activity that is structured and adapted to the local cultural context can be more acceptable and effective in improving the physical health of participants. These results reinforce the understanding that local culture-based gymnastics programs such as senam Sumatera Selatan Bersatu can be an effective tool in improving physical fitness. In practical terms, the results of this study emphasize the importance of integrating cultural aspects in designing health and wellness programs, which can lead to better participation and more optimal results. Higher education institutions and policymakers may consider adopting local culture-based gymnastics programs as part of Student physical fitness curricula. Future research can develop more exercise programs that are rooted in other local cultures, so that they can be adopted by various communities throughout Indonesia. The training and development of instructors focused on teaching local culture-based gymnastics programs needs to be improved to ensure effective and sustainable implementation. This research has made an important contribution to our understanding of the effectiveness of local culture-based fitness programs.

### Conflict of interest

The authors declare no conflict of interest. No financial support was received.

### Ethics Statement

Ethical clearance (No.106/KEPK/RSI-U/VII/2024) for this research was obtained from the Research Ethics of Health Research Ethics Committee of Malang Islamic hospital, Malang City, East Java, Indonesia

### Author Contributions

Study Design, NS ; Data Collection, NS, ET ; Statistical Analysis, ET,ES,AS,AT,IBE and RWK; Data Interpretation, ES, AS, AT, IBE and RWK; Manuscript Preparation, NS, ET,ES,IBE and RWK; Literature Search, IBE and RWK. All authors have read and agreed to the published version of the manuscript.

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