



Physical Condition Analysis of Central Java PPLP Rowing Athletes

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Abstract

The importance of physical condition in rowing is very influential in the development of an athlete. One of the efforts made to improve the physical condition of athletes is to analyze the physical condition of athletes, which will be the solution to the problem. This study aims to determine the physical condition of rowing athletes at the Central Java Student Education and Training Center (PPLP). This type of research is descriptive quantitative. The population of this study was 10 PPLP Central Java rowing athletes, consisting of 3 boys and 7 girls. The data collection technique of this study used tests and measurements of physical conditions. The data analysis technique used is descriptive statistics. The results of this study indicate that the physical condition of PPLP rowing athletes in Central Java is quite good in the parameters of flexibility, balance, muscle power, strength, cardiovascular endurance, speed, body composition, and explosive strength. The conclusion of this study is that the physical condition of PPLP rowing athletes is quite good, and there are several aspects that need to be improved, such as cardiopulmonary endurance and flexibility.

INTRODUCTION

Exercise is highly beneficial to general health, as it can improve quality of life and slow the decline in one's fitness status due to aging, disease, and the environment (Comachio et al., 2025; (Hu et al., 2025). Regular exercise can improve cardiac, respiratory and muscle function. Regular physical activity has a wide range of positive impacts on various bodily functions, including improving the efficiency of the heart, strengthening the respiratory system, and increasing muscle strength and endurance (Heljezović et al., 2025; Rocha et al., 2024). In addition, exercise also plays an important role in maintaining the body's metabolic balance (Schneider-Heieck et al., 2025). Exercise done regularly can improve physical fitness (Kolunsarka et al., 2024; Unger et al., 2024). Any sport cannot be separated from the need for good physical fitness, one of which is rowing. Rowing is one type of sport that requires the best physical condition (Karatzanos, 2020; Ye et al., 2021). To achieve maximum results, this sport relies on strength, endurance, and body coordination. According to (Putra et al., 2022), said that physical condition greatly affects a person's performance both in training situations and matches to perform to achieve victory in a match.

Physical condition factors play a very important role in achieving an achievement, it is likely that athletes who do not achieve maximum performance are caused by weak physical factors (Azizah et al., 2019; Gandang Eka Prayoga, 2020). Excellent physical condition is an essential foundation for rowing athletes in achieving peak performance (Bahtiar Hari Hardovi, 2022; Zhang et al., 2024). Physical condition is an important requirement for improving athlete performance and is also a basic requirement for competitive

sports (Azizah et al., 2019; Ficarra et al., 2024). An in-depth analysis of the physical condition of PPLP Central Java rowing athletes is crucial to identify individual strengths and weaknesses, so that a targeted and effective training program can be designed. Strong physical capabilities enable athletes to optimize stroke, transfer energy effectively to the boat, and maintain a high level of performance during training and competition, thus becoming a determining factor for success in rowing. Some previous studies have shown that the physical condition of rowing athletes is strongly influenced by the type of training they undergo, age, and genetic factors. For example, research by (Nugent et al., 2020) revealed that elite rowing athletes had significantly higher levels of muscular strength and cardiovascular endurance compared to novice athletes. Another study by (Beattie et al., 2014) identified that structured training, which combined strength and endurance training, significantly improved athletes' performance in rowing competitions. However, although these studies provide valuable insights, most focus on international or elite level rowing athletes, while the physical condition of athletes at lower levels, such as at the Student Education and Training Center (PPLP), still receives less attention. PPLP as a young athlete development institution in Indonesia has a very important role in preparing talented athletes to compete at a higher level. Therefore, more in-depth research is needed to analyze the physical condition of rowing athletes at PPLP, in order to provide a strong basis for the development of more effective and efficient training programs.

This study differs from other studies in that it discusses the physical condition of athletes and the factors that influence athletes in improving their physical condition and performance

(Susilawati & Suparni, 2023). Excellent physical condition is the main foundation for athletes to achieve peak performance in their respective sports. In addition, there has not been much research discussing the physical condition analysis of PPLP athletes, especially those participating in rowing in Central Java. Physical condition is important to analyze because it is one of the determining factors for an athlete's success in achieving performance. Good physical condition allows athletes to train harder, recover faster, and reduce the risk of injury (Zalsha Ayuadela Efendi et al., 2023).

By considering the importance of physical condition in rowing, as well as the lack of research that focuses on athletes at the coaching level such as PPLP, this study aims to identify and analyze the physical condition of rowing athletes at PPLP Central Java. This research is expected to contribute in designing a more targeted coaching strategy, so as to increase the potential of athletes and the achievements of rowing in the future.

METHOD

This research is a type of descriptive quantitative research (Sugiyono, 2019). Descriptive research is research intended to investigate circumstances, conditions, or other things that have been mentioned, the results of which are presented in the form of a research report (Ginanjar et al., 2020). This method was chosen because it is able to provide unusual results and can be tested for validity and reliability.

The research design used was a cross-sectional survey design. This means that data was collected at a specific point in time without intervention, solely to observe and describe the

physical condition of the athletes at the time of the study.

The sample in this study consisted of 10 athletes, comprising 3 males and 7 females aged 15–18 years.

The research instrument used a physical fitness test consisting of cardiovascular endurance (VO2 Max), strength (handgrip strength), muscle power (sit-ups and push-ups), flexibility (sit and reach test), speed (30-meter sprint), explosive strength (vertical jump), balance (one-leg balance), and body composition (BMI measurement and body fat analysis).

The analysis used in this study employed descriptive analysis, including mean, standard deviation, and percentage of physical condition, ranging from very less to excellent.

The following are the stages of data analysis used in this study:

1. The data from each test is then converted according to the standard for each test item, which is represented in the form of numbers.
2. Furthermore, the data was interpreted by categorizing physical conditions into five categories: excellent, good, fair, poor, and very poor. The categorization formula based on the mean and standard deviation is as follows:

Table 1. Categorization Formula

No.	Formula or Interval	Category
1	$X > (M + 1.5 \text{ SD})$	Excellent
2	$(M + 0.5 \text{ SD}) < X < (M + 1.5 \text{ SD})$	Good
3	$(M - 0.5 \text{ SD}) < X < (M + 0.5 \text{ SD})$	Fair
4	$(M - 1.5 \text{ SD}) < X < (M - 0.5 \text{ SD})$	Poor
5	$X < (M - 1.5 \text{ SD})$	Very Poor

Source: Maryami, D. (2016)

3. After the data is collected, the next step is to analyze the data to get conclusions from the research. The data analysis used in this

research is quantitative descriptive data analysis using percentages. The percentage for each category is calculated using the following percentage formula:

$$P = \frac{F}{N} \times 100\%$$

Description:

P = Percentage sought

F = Frequency

N = Number of respondents

RESULT AND DISCUSSION

The purpose of this study was to evaluate the physical condition of PPLP Central Java rowing athletes, find their physical strengths and

weaknesses, and make recommendations for a useful training program to improve their physical abilities. The following are the results obtained from this study:

1. Flexibility (Sit And Reach)

This test aims to determine a person's level of flexibility, determine the risk of injury, and evaluate how effective an exercise program that focuses on improving flexibility is. Flexibility is important not only for injury prevention, but also for improving performance ability (Nita, 2024). This test also assists athletes in increasing the range of motion required for sports that require high flexibility. The results of the flexibility test are as follows:

Table 2. Normative Calculation of Flexibility

No	Interval		Frequency		Percentage %		Category
	Man	Woman	Man	Woman	Man	Woman	
1	> 23 cm	> 18 cm	1	1	33,3 %	14,2 %	Very good
2	21 - 23 cm	16 - 18 cm	0	2	0 %	28,5 %	Good
3	19 - 20 cm	15 - 16 cm	2	4	66,6 %	57,1 %	Simply
4	17 - 18 cm	13 - 15 cm	0	0	0 %	0 %	Less
5	< 17 cm	< 13 cm	0	0	0 %	0 %	Not at all
	Amount		3	7	100 %	100 %	

From the table above, the results of categorizing the flexibility and elasticity of the hamstring muscles of male athletes who are in the excellent category are 1 athlete or 33.3%, good 0 athletes or 0%, enough 2 athletes or 66.6%, less athletes or 0%, and very less 0 athletes or 0%. As for female athletes who are in the excellent category 1 athlete or 14.2%, good 2 athletes or 28.5%, enough 4 athletes or 57.1%, less athletes or 0%, and very less 0 athletes or 0%. From these data it can be concluded that the flexibility and elasticity of the hamstring muscles of PPLP rowing athletes in Central Java obtained the most

results with 6 athletes in the sufficient category. The normative test results can be seen in Figure 1 below:

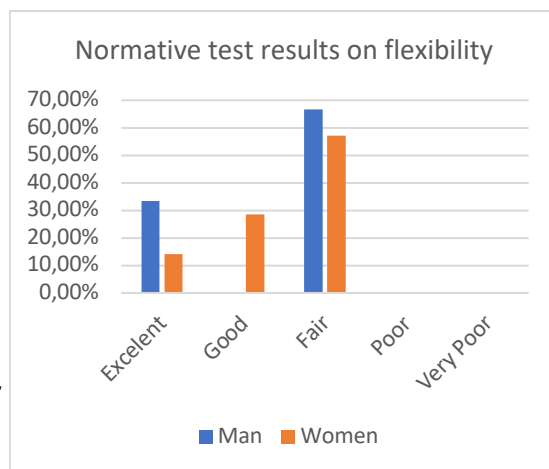


Figure 1. Normative Calculation of Flexibility

2. Explosive Power (Vertical Jump)

This test aims to measure a Man's ability to generate explosive power when performing a vertical jump, which is very important in rowing. The results can be used to evaluate leg muscle strength, find areas that need improvement, and create better training plans to improve athlete performance. The following vertical jump explosive power test results:

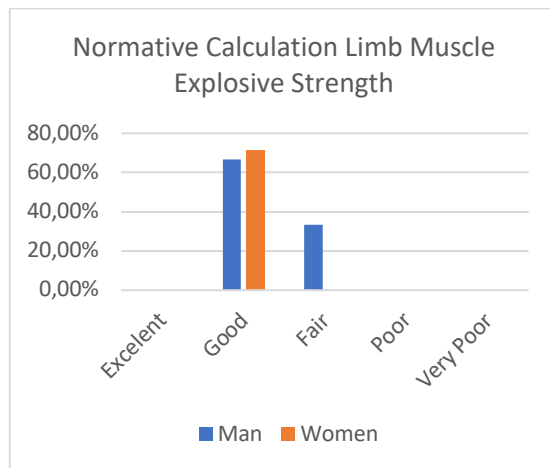


Figure 2. Normative Calculation Limb Muscle Explosive Strength

Table 3. Normative Calculation Limb Muscle Explosive Strength

No	Interval		Frequency		Percentage %		Category
	Man	Woman	Man	Woman	Man	Woman	
1	> 74 cm	> 42 cm	0	0	0	0	Very good
2	64 - 74 cm	37 - 42 cm	2	5	66,6	71,4	Good
3	53 - 63 cm	32 - 36 cm	1	0	33,3	0	Simply
4	42 - 52 cm	27 - 31 cm	0	2	0	28,5	Less
5	< 42 cm	< 27 cm	0	0	0	0	Not at all
Amount			3	7	100 %	100 %	

The table above shows the results of Central Java athletes achieved the best results in categorizing the explosive strength of the leg muscles of male athletes who are in the excellent category of 0 athletes or 0%, good 2 athletes or 66.6%, enough 1 athlete or 33.3%, less athletes or 0%, and very less 0 athletes or 0%. As for female athletes who are in the excellent category 0 athletes or 0%, good 5 athletes or 71.4%, enough 0 athletes or 0%, less 2 athletes or 28.5%, and very less 0 athletes or 0%. The data shows that PPLP rowing

The results of descriptive statistical calculations of Central Java PPLP rowing male athletes, the strength of the leg muscle explosion obtained a mean or average value of 58.6 median value 61 sum value or total 176 highest score 68, lowest score 47, and standard deviation value or standard deviation 10.6. As for female athletes, the mean or average value is 35, median value 37, sum value or total 245, highest score 39, lowest score 27, and standard deviation value or standard deviation 4.8. After the data is collected, they are categorized based on their normative calculations as follows:

3. Strength (Hand Grip Strength)

In this test, a handheld dynamometer is used to measure how much pressure the hand can exert in a single grip. The purpose of this test is to assess the strength of the hand and forearm muscles, which is essential for many types of

sports and physical activities, such as rowing. The results can be used to assess the condition of muscle strength, track the progress of strength training, and assist in creating better training plans for athletes to improve their performance. The results of the hand strength and power test are as follows:

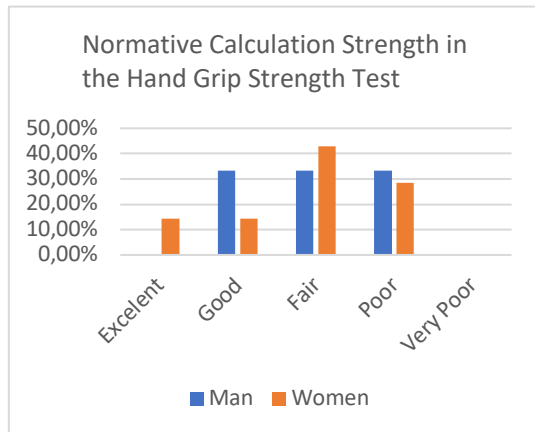


Figure 3. Normative Calculation Strength in the Hand Grip Strength Test

The results of descriptive statistical calculations from data on PPLP Central Java rowing male athletes, the strength of the hand grip test strength test obtained a mean or average value of 52.5 median value 52.7 sum value or total 157.7 highest score 56.1, lowest score 48.9, and standard deviation value or standard deviation 3.6. As for female athletes, the mean or average value is 29.0, the median value is 29.2, the sum or total value is 203.2, the highest score is 36.5, the lowest score is 22.4, and the standard deviation value is 4.5. After the data is collected, they are categorized based on normative calculations as follows:

Table 4. Normative Calculation Strength in the Hand Grip Strength Test

No	Interval		Frequency		Percentage %		Category
	Man	Woman	Man	Woman	Man	Woman	
1	> 57	> 35	0	1	0	14,2	Very good
2	54 - 57	31 - 35	1	1	33,3	14,2	Good
3	50 - 53	26 - 30	1	3	33,3	42,8	Simply
4	47 - 49	22 - 25	1	2	33,3	28,5	Less
5	< 47	<22	0	0	0	0	Not at all
Amount			3	7	100 %	100 %	

The table above shows the results of categorizing the strength of male athletes in the hand grip strength test in the excellent category 0 athletes or 0%, good 1 athlete or 33.3%, enough 1 athlete or 33.3%, less 1 athlete or 33.3%, and very less 0 athletes or 0%. As for female athletes who are in the excellent category 1 athlete or 14.2%, good 1 athlete or 14.2%, enough 3 athletes or 42.8%, less 2 athletes or 28.5%, and very less 0 athletes or 0%. The data shows that PPLP rowing Central Java athletes received the best results in

the strength test in the hand grip strength test, with 4 of them in the sufficient category.

4. Muscle Endurance (Push Up and Sit Up)

The sit-up test assesses the endurance of the abdominal and core muscles, while the push-up test assesses the endurance of the arms, shoulders and chest muscles. The purpose of both tests is to determine how well a muscle can sustain work over a period of time, identify the fitness level of the muscle, and help create an exercise plan to

improve muscle strength. This test is especially important for athletes and people who need ideal muscle strength for physical activity and sports. The push up and sit up test results are as follows:

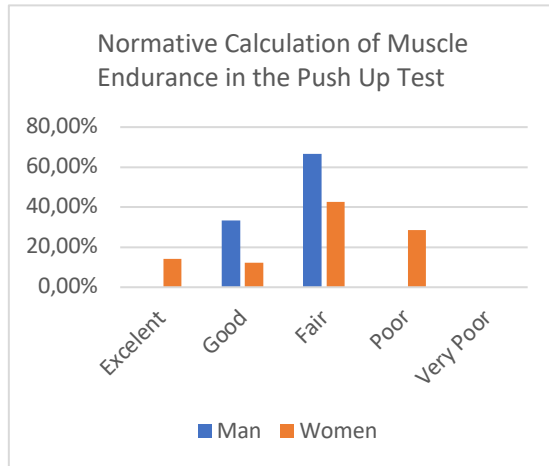


Figure 4. Normative Calculation of Muscle

From the results of descriptive statistical calculations of data on male athletes rowing PPLP Central Java, muscle endurance in the push up test (table 8) obtained a mean or average value of 58 median value 59 sum value or total 174 highest score 63, lowest score 52, and standard deviation value or standard deviation 5.5. As for female athletes, the mean or average value is 39.2, the median value is 38, the sum value or total of 275, the highest score is 47, the lowest score is 32, and the standard deviation value is 5.3.

And the results of descriptive statistical calculations of data on male athletes rowing PPLP

Endurance in the Push Up Test

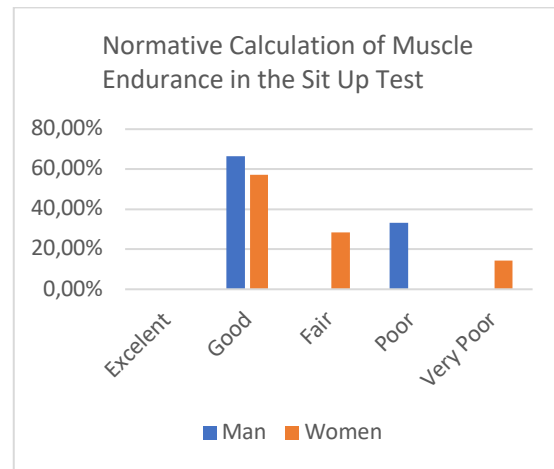


Figure 5. Normative Calculation of Muscle Endurance in the Sit Up Test

Central Java, muscle endurance in the sit up test (table 9) obtained a mean or average value of 48 median value 50 sum value or total 144 highest score 51, lowest score 43, and standard deviation value or standard deviation 4.3. As for female athletes the mean or average value is 49, the median value is 51, the sum value or the number 343, the highest score is 53, the lowest score is 41 and the standard deviation value or standard deviation is 4.3. After the data is obtained, it is then categorized following the normative calculation:

Table 5. Normative Calculation of Muscle Endurance in the Push Up Test

No	Interval		Frequency		Percentage %		Category
	Man	Woman	Man	Woman	Man	Woman	
1	> 66	> 47	0	1	0	14,2	Very good
2	60 - 66	42 - 47	1	1	33,3	14,2	Good
3	55 - 59	37 - 41	2	3	66,6	42,8	Simply
4	49 - 54	31 - 36	0	2	0	28,5	Less
5	< 48	< 31	0	0	0	0	Not at all
	Amount		3	7	100 %	100 %	

Table 6. Normative Calculation of Muscle Endurance in the Sit Up Test

No	Interval		Frequency		Percentage %		Category
	Man	Woman	Man	Woman	Man	Woman	
1	> 54	> 55	0	0	0	0	Very good
2	50 - 54	51- 55	2	4	66,6	57,1	Good
3	46 - 49	46 - 50	0	2	0	28,5	Simply
4	41 - 45	42 - 45	1	0	33,3	0	Less
5	< 41	< 42	0	1	0	14,2	Not at all
	Amount		3	7	100 %	100 %	

From table 10, it can be seen that the results of the categorization of muscle endurance in the push up test for male athletes who are in the excellent category 0 athletes or 0%, good 1 athlete or 33.3%, enough 2 athletes or 66.6%, less 0 athletes or 0%, and very less 0 athletes or 0%. As for female athletes who are in the excellent category 1 athlete or 14.2%, good 1 athlete or 14.2%, enough 3 athletes or 42.8%, less 2 athletes or 28.5%, and very less 0 athletes or 0%. From these data it can be concluded that the endurance of the arm muscles of PPLP rowing athletes in Central Java obtained the most results with 5 athletes in the sufficient category.

And in table 11 above, it can be seen that the results of categorization / strength in the hand grip strength test for male athletes who are in the excellent category of 0 athletes or 0%, good 2 athletes or 66.6%, enough 0 athletes or 0%, less 1 athlete or 33.3%, and very less 0 athletes or 0%. As for female athletes who are in the excellent category 0 athletes or 0%, good 4 athletes or 57.1%, enough 2 athletes or 28.5%, less 0 athletes or 0%, and very less 1 athlete or 14.2%. From these data it can be concluded that the abdominal muscle endurance of PPLP rowing athletes in Central Java obtained the most results with 6 athletes in the good category.

5. Speed/Speed (30 Meter Sprint Run)

The 30 Meter Sprint Test is a physical condition test to measure speed, which is a

perMan's ability to cover a certain distance in the shortest amount of time. This test measures the athlete's ability to accelerate and maintain maximum speed over short distances. The purpose of this test is to evaluate each athlete's level of speed, determine their potential in certain sports that require high speed, and assist in creating a better training plan to improve sprint ability. The results of the 30-meter sprint speed and velocity are as follows:

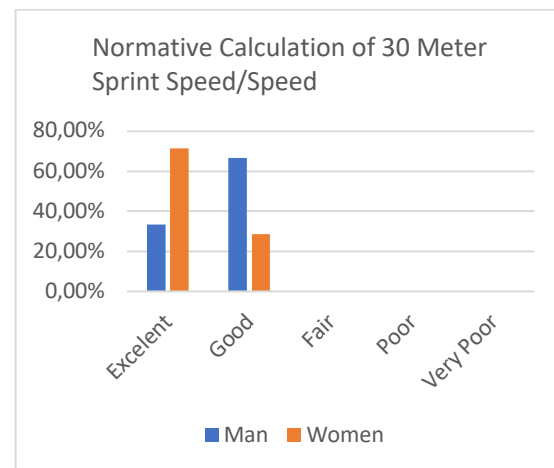


Figure 6. Normative Calculation of 30 Meter Sprint Speed/Speed

The results of speed in the 30 meter sprint test, based on descriptive statistical calculations of Central Java PPLP rowing male athletes, obtained a mean or average value of 4.1 median value of 4.1 sum value or a total of 12.3 highest score 4.2 lowest score 4, and a standard deviation value or standard deviation of 0.1. As for female athletes, the mean or average value is 5.1, the median value is 5.2, the sum value or the sum of 36, the highest

score is 5.7, the lowest score is 4.6 and the standard deviation value or standard deviation is 0.3 After the data is collected, it is categorized based on normative calculations as follows:

Table 7. Normative Calculation of 30 Meter Sprint Speed/Speed

No	Interval		Frequency		Percentage %		Category
	Man	Woman	Man	Woman	Man	Woman	
1	> 4.0 seconds	> 5.5 seconds	1	5	33,3	71,4	Very good
2	4.0 - 4.5 seconds	5.5 - 6.0 seconds	2	2	66,6	28,5	Good
3	4.6 - 5.0 seconds	6.1 - 6.5 seconds	0	0	0	0	Simply
4	5.1 - 5.5 seconds	6.6 - 7.0 seconds	0	0	0	0	Less
5	> 5.5 seconds	< 7.0 seconds	0	0	0	0	Not at all
	Amount		3	7	100 %	100 %	

The table above shows the results of categorizing the speed of male athletes in the 30-meter sprint who are in the excellent category of 1 athlete or 33.3%, good 2 athletes or 66.6%, enough 0 athletes or 0%, less 0 athletes or 0%, and very less 0 athletes or 0%. As for female athletes who are in the excellent category 5 athletes or 71.4%, good 2 athletes or 28.5%, enough 0 athletes or 0%, less 0 athletes or 0%, and very less 0 athletes or 0%. The data shows that PPLP rowing Central Java athletes reach the highest level of speed and speed, with 6 athletes in the excellent category.

6. Cardiovascular Endurance Measured Through VO2 Max Test (Bleep Test)

Physical condition greatly affects the maximum oxygen volume (VO2Max) value of an athlete (Putra et al., 2022). This test is done by running back and forth for twenty meters while following increasingly fast sound cues (bleep). The purpose of this test is to determine the body's maximum capacity to consume oxygen (VO2 Max), determine how good a perMan's aerobic fitness is, and help create a better endurance training plan. The results of the VO2 Max test, or bleep test, are used to assess the cardiovascular endurance of athletes, especially those who participate in sports that require high endurance,

such as soccer, long-distance running and rowing.

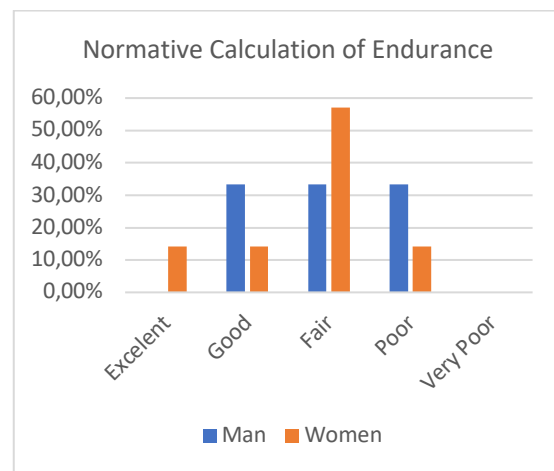


Figure 8. Normative Calculation of Endurance

Cardiovascular endurance through the VO2 Max test (bleep test), based on descriptive statistical calculations of data for male athletes rowing PPLP Central Java obtained a mean or average value of 48.9 median value of 48.4 sum value or total of 146.9 highest score of 54.3 lowest score of 44.2, and a standard deviation value or standard deviation of 5.07. As for female athletes, the mean or average value is 37.2, the median value is 36.8, the sum value or the total of 260.6, the highest score is 44.9, the lowest score is 31.8 and the standard deviation value or standard deviation is 4.04 After the data is obtained, it is then categorized following the normative calculation:

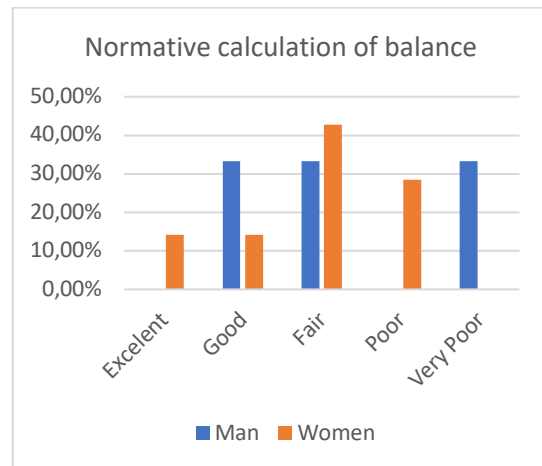
Table 8. Normative Calculation of Endurance

No	Interval		Frequency		Percentage %		Category
	Man	Woman	Man	Woman	Man	Woman	
1	> 56	> 43	0	1	0	14,2	Very good
2	51 - 56	39 - 43	1	1	33,3	14,2	Good
3	46 - 50	35 - 38	1	4	33,3	57,1	Simply
4	41 - 45	31 - 34	1	1	33,3	14,2	Less
5	< 41	< 31	0	0	0	0	Not at all
	amount		3	7	100 %	100 %	

The table above shows that the results of the classification of cardiovascular endurance of male athletes who are in the excellent category are 0 athletes or 0%, good 1 athlete or 33.3%, enough 1 athlete or 33.3%, less 1 athlete or 33.3%, and very less 0 athletes or 0%. As for female athletes who are in the excellent category 1 athlete or 14.2%, good 1 athlete or 14.2%, enough 4 athletes or 57.1%, less 1 athlete or 14.2%, and very less 0 athletes or 0%. The data shows that PPLP rowing Central Java athletes have the best cardiovascular endurance, with 5 of them being in the sufficient category.

7. Balance/Balance (Single Leg Balance Test)

This test is performed by standing on one leg without losing balance for as long as possible. The purpose of this test is to evaluate the body's coordination ability to maintain balance, find possible weaknesses in the posture control system, and assist in the creation of an exercise program that improves body stability and control. Athletes of sports such as rowing, which require good balance to ensure their best performance, are in great need of the results of this test. Here are the results of the balance:

**Figure 9.** Normative calculation of balance

The results of descriptive statistical calculations carried out on the data of PPLP Central Java rowing male athletes regarding balance (one leg balance test). obtained a mean or average value of 17.7 median value of 19.8 sum value or total of 53.3 highest score 29.4 lowest score 4.1 and standard deviation value or standard deviation 12.7. As for female athletes, the mean or average value is 19.8, the median value is 16.4, the sum value or total is 139.2, the highest score is 36.1, the lowest score is 9.02 and the standard deviation value or standard deviation is 9.6 After the data is obtained, it is then categorized following the normative calculation:

Table 9. Normative calculation of balance

No	Interval	Frequency		Percentage %		Category
		Man	Woman	Man	Woman	
1	> 34	0	1	0	14,2	Very good
2	24 - 34	1	1	33,3	14,2	Good
3	14 - 23	1	3	33,3	42,8	Simply
4	(4) - 13	0	2	0	28,5	Less
5	< 4	1	0	33,3	0	Not at all
	Amount	3	7	100 %	100 %	

The table above shows the results of categorizing the balance of male athletes. in the excellent category 0 athletes or 0%, good 1 athlete or 33.3%, enough 1 athlete or 33.3%, less 0 athletes or 0%, and very less 1 athlete or 33.3%. As for female athletes who are in the excellent category 1 athlete or 14.2%, good 1 athlete or 14.2%, enough 3 athletes or 42.8%, less 2 athletes or 28.5%, and very less 0 athletes or 0%. The data shows that PPLP rowing Central Java athletes achieve the best results in terms of balance, with 4 athletes in the sufficient category.

8. Body Composition (Using BMI Measurement and Body Fat Analysis).

BMI is calculated by dividing weight (kg) by the square of height (m²) and is used as a general indicator to determine weight categories, such as underweight, normal, overweight, or obese. The purpose of BMI measurement is to simply evaluate body composition, identify potential weight-related health risks, as well as assist in the planning of an appropriate fitness or diet program. While BMI provides a general overview of weight status, it does not differentiate between muscle mass and body fat, so it needs to be combined with other methods for a more accurate body composition analysis. The results of body composition (using BMI

measurement and body fat analysis) are as follows:

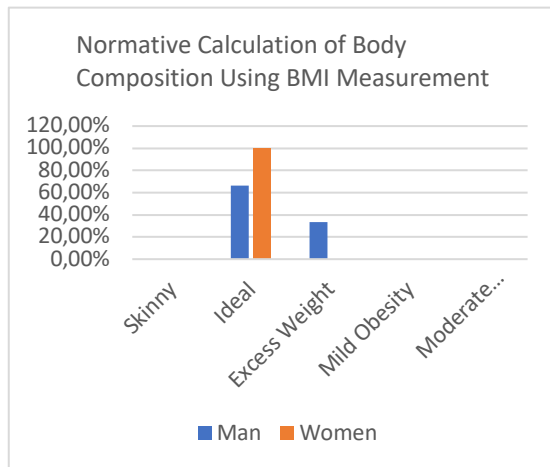


Figure 10. Normative Calculation of Body Composition Using BMI Measurement

From the results of descriptive statistical calculations of data on male athletes rowing PPLP Central Java, body composition (using BMI measurements and body fat analysis). obtained a mean or average value of 23.7 median value 23.3 sum value or total 71.1 highest score 27.6 lowest score 20.2, and standard deviation value or standard deviation 3.7. As for female athletes, the mean or average value is 23.0, the median value is 23.2, the sum or total value is 161.2, the highest score is 24.9, the lowest score is 20.9, and the standard deviation or standard deviation value is 1.4 After the data is obtained, it is then categorized following the normative calculation:

Table 10. Normative Calculation of Body Composition Using BMI Measurement

No	Interval	Frequency		Percentage %		Category
		Man	Woman	Man	Woman	
1	< 18,5	0	0	0	0	skinny
2	18,5 -24,9	2	7	66,6	100	ideal
3	25,0 - 29,9	1	0	33,3	0	excess weight
4	30,0 - 34,9	0	0	0	0	ringa obesity
5	35,0 - 39,9	0	0	0	0	moderate obesity
6	> 40	0	0	0	0	severe obesity
Amount		3	7	100 %	100 %	

The table presents the results of body composition categorization based on BMI measurements for male and female athletes. Among male athletes, 66.6% fall within the "ideal" BMI range, while 33.3% are categorized as having "excess weight." There are no male athletes in the "underweight," "overweight," or "severe obesity" categories. In contrast, all female athletes (100%) are classified as having an "ideal" BMI, with no representation in the other categories. This data suggests that the female athletes have better overall body composition in relation to BMI, with all being in the healthy range. Meanwhile, male athletes show a mix of ideal body composition and excess weight, with no representation in extreme categories such as underweight or obesity. The highest number of athletes in the "ideal" BMI category (9 athletes) is observed within the Central Java PPLP rowing team, highlighting a strong overall body composition within this group.

DISCUSSION

Based on the research results, it was found that Central Java PPLP rowing athletes have the following physical conditions:

1. The average flexibility of Central Java PPLP rowing athletes is in the adequate category, with 6 athletes or 60%.
2. The average explosive leg muscle strength of Central Java PPLP rowing athletes is in the good category, with 7 athletes or 70%.
3. The average strength of rowing athletes from the Central Java PPLP is in the adequate category, with 4 athletes or 40%.
4. The average upper body strength of rowing athletes from the Central Java PPLP is in the adequate category, with 5 athletes or 50%.
5. The average cardiovascular endurance of rowing athletes from the Central Java PPLP is in the good category, with 6 athletes or 60%.
6. The average speed of rowing athletes at the Central Java PPLP is in the very good category, with 6 athletes or 60%.
7. The average cardiovascular endurance of rowing athletes at the Central Java PPLP is

in the adequate category, with 5 athletes or 50%.

8. The average balance of PPLP Central Java rowing athletes is in the fair category with 4 athletes or 40%.
9. The average body composition of PPLP Central Java rowing athletes is in the fair category with 9 athletes or 90%.

1. Flexibility

60% of athletes were in the adequate category. Adequate flexibility is important in rowing to support optimal range of motion during rowing activities. However, compared to research by (Siregar, 2018) which showed that national rowing athletes had flexibility in the good category, these results indicate room for improvement through more intensive stretching training programs.

2. Lower Limb Muscle Explosive Strength

70% of athletes are in the good category. Good lower limb muscle explosive strength is very important in the initial phase of rowing to generate strong thrust. These results are in line with the findings by (Rahayu & others, 2024), which emphasize the importance of lower limb muscle strength in rowing athlete performance.

3. Strength

40% of athletes are in the adequate category. Overall muscle strength plays a role in the stability and efficiency of rowing movements. These results indicate that most athletes have strength that needs to be improved, as suggested by research by (Fadilah et al., 2023) which emphasizes the importance of muscle strengthening programs in rowing athlete training.

4. Arm Muscle Power

50% of athletes are in the adequate category. Adequate arm muscle strength is important for maintaining rowing power during competitions. These results indicate the need for improvement through specific strength training for arm muscles, as recommended by research by (Pianda & others, 2024)

5. Speed

60% of athletes are in the very good category. High speed is important in the early stages of a race to gain a leading position. Although there has been no specific research looking at the effect of running speed on the performance of rowing athletes, speed does have an effect on the physical condition of athletes (Ahyar & others, 2022)

6. Cardiovascular Endurance

50% of athletes are in the adequate category. Good cardiovascular endurance is important for maintaining performance during the race. This result indicates the need for improvement through aerobic training programs, as suggested by research by (Prayuda & Firmansyah, 2017).

7. Balance

40% of athletes are in the adequate category. Good balance is important for boat stability and rowing movement efficiency. These results indicate the need for additional balance training, as recommended by research by (Dewi Yuliawati et al., 2022).

8. Body Composition

90% of athletes are in the adequate category. Optimal body composition is important for movement efficiency and endurance. These results indicate that most athletes have body composition close to ideal, but there is still room for improvement through proper nutrition and training programs, as suggested by research by (Latifah et al., 2019).

Based on the results of physical condition measurements conducted on rowing athletes from the Central Java Provincial Sports Training Center (PPLP), it was found that the majority of athletes demonstrated explosive power and speed capabilities that were good to very good, as reflected in the results of the vertical jump and speed tests, which met the criteria for those categories according to the applicable assessment standards. However, the results of the muscle strength test through hand grip strength

measurements indicate a significant disparity among individuals, with some athletes showing strength levels below the recommended threshold for the rowing sport. Furthermore, the results of the muscle endurance evaluation through push-up and sit-up tests showed that the majority of athletes were in the moderate to good category, although there were still some athletes who needed to increase the intensity and quality of their training to achieve optimal performance.

Measurements of flexibility through flexibility tests showed significant variation, with most athletes demonstrating good flexibility levels, though some individuals still require improvement in this area to minimize the risk of injury during training and competitions. The most striking finding was in the cardiovascular endurance component, measured through VO_2 max estimation using the bleep test, which showed highly variable results and tended not to reach optimal levels. This condition has the potential to affect the performance of rowing athletes, especially those competing in long-distance boat events that require high cardiovascular endurance.

Overall, these findings indicate that the training program implemented for athletes at the Central Java PPLP has been sufficiently effective in maintaining explosive power and muscle strength. However, adjustments to the training program are needed, with a greater focus on developing cardiovascular endurance, flexibility, and balance, to optimize athletes' performance comprehensively. The implementation of a training approach that emphasizes strengthening these aspects, accompanied by a structured and continuous stretching program, is expected to address the limitations identified in this study.

CONCLUSION

Overall, the physical condition of Central Java PPLP rowing athletes shows that most components are in the fair to good category. However, there are several aspects that need to be improved, particularly in terms of general muscle strength, arm muscle strength, cardiovascular endurance, and balance. Improvements in these aspects can be achieved

through structured and specific training programs tailored to the needs of each physical condition component.

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