Physical Condition Profile of Male Volleyball Athletes for the 2025 Magelang Regency Pre-Provincial Athletics Competition

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Abstract

This study aims to determine and analyze the physical condition profile of male volleyball athletes participating in the Magelang Regency Pre-PORPROV. The physical condition components analyzed include arm muscle strength, back muscle strength, leg muscle power, and cardiorespiratory endurance. The study used a quantitative approach with a survey method. The research subjects consisted of 14 male volleyball athletes from the Magelang Regency Pre-PORPROV team. The measurement instruments used were push-ups, back-ups, vertical jumps, and beep tests. Data analysis used a quantitative descriptive approach with normative categorization. The results showed that the overall physical condition profile of the male volleyball athletes of the Magelang Regency Pre-PORPROV team was in the moderate category (42.86%). Component analysis showed that arm muscle strength was in the good category (50%), back muscle strength was in the moderate category (42.86%), leg muscle power was in the moderate category (57.14%), and cardiorespiratory endurance was in the moderate category (35.71%). This study recommends a more structured training program with an emphasis on improving cardiorespiratory endurance and leg muscle power to maximize the athletes' performance in facing the PORPROV competition.

Keywords: physical condition; volleyball athletes; training program; performance improvment

1. Introduction

Volleyball is one of the most popular sports in Indonesia, with competition levels ranging from regional to national. The Provincial Sports Week (PORPROV) is a provincial-level sports competition held every four years and serves as a benchmark for athletes' achievements at the regional level. Magelang Regency, as one of the contingents participating in the Central Java PORPROV, is preparing its men's volleyball team to compete and achieve optimal results.

Physical condition is one of the determining factors for an athlete's success in volleyball. (Obompa, 2019) states that physical condition is the foundation of an athlete's performance, because technique, tactics, and mental strength can be developed well if they have good physical quality. In the context of volleyball, excellent physical condition enables athletes to perform explosive movements such as jumping smashes, blocking, and maintaining performance throughout the match (G. Ziv, 2016).

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According to (Sheppard et al., 2010), the dominant physical components in volleyball include strength, power, speed, agility, and endurance. All of these components are integrated and support the athlete's performance on the court. Arm muscle strength is needed to serve, smash, and block. Back muscle strength supports body stability when performing various techniques. Leg muscle power is needed to jump when smashing and blocking (G. Ziv, 2016). Meanwhile, cardiorespiratory endurance allows athletes to maintain their performance throughout the match.

Research conducted by Bruno (2007) shows that elite volleyball athletes have better physical characteristics than sub-elite athletes, especially in terms of vertical jump, arm muscle strength, and cardiorespiratory endurance. This shows that physical condition plays an important role in determining the performance level of volleyball athletes.

In addition, Gabbett et al. (2007) states that there is a positive relationship between physical capacity and the technical skills of volleyball athletes. Athletes with good physical condition tend to have better technical skills as well. In addition, (T. Gabbett et al., 2007) stated that there is a positive relationship between physical capacity and the technical skills of volleyball athletes. Athletes with good physical condition tend to have better technical skills as well.

However, there has not been much research specifically examining the physical condition profile of volleyball athletes at the regional level, particularly in Magelang Regency. In fact, knowledge about the physical condition profile of athletes is very important as a basis for designing appropriate and specific training programs according to the needs of athletes (Wahyu Cirana, Arif Rohman Hakim, 2023). Training programs developed based on empirical data will be more effective in improving athletes' performance and preventing injuries during training and competition (T. J. Gabbett, 2016).

Based on this background, this study aims to determine and analyze the physical condition profile of male volleyball athletes participating in the Magelang Regency PORPROV. The results of this study are expected to serve as evaluation material for coaches and managers of the Magelang Regency volleyball team in preparing their athletes for the PORPROV competition.

2. Method

Research design
This study uses a quantitative approach with a test survey method. This method was chosen because it is effective in describing the physical profile of athletes through standardized and objective measurements. According to (Papadopoulou et al., 2019), the test survey method is an appropriate approach for obtaining descriptive data on the physical and physiological characteristics of subjects in sports activities.

Research subjects
The subjects in this study were all 14 male volleyball athletes on the Magelang Regency Pre-PORPROV team. The sampling technique used total sampling, so that the entire population was used as the sample. The characteristics of the subjects included: male gender, age between 20 and 22 years, height between 160 and 173 cm, and having at least 1 year of regular training experience and being officially registered as a Pre-PORPROV athlete.

Table 1. Characteristics of research subjects

Characteristics	Min	Max	Average	Standard deviation
Age (years)	20	22	20,86	0,77
Height (cm)	160	173	167,43	4,27
Weight (kg)	55	75	65,21	5,86
Training experience (years)	3	8	5,64	1,45

Research instruments

The instruments used to measure physical condition components consist of:

1. Push-Up Test

Used to measure arm muscle strength. The test is performed with the athlete in a prone position, then performing as many push-ups as possible within 1 minute. The score is obtained from the number of repetitions performed with correct technique. This test has a validity of 0.86 and reliability of 0.93 (Bishop, 2008).

2. Back-Up Test

Used to measure back muscle strength. Athletes lie on their stomachs with their hands behind their heads, then perform upper body lifts for 1 minute. Scores are based on the number of correct movements. Validity is 0.82 and reliability is 0.90 (Miller et al., 2006).

3. Vertical Jump Test

Measures leg muscle power. Athletes stand next to a wall, jump as high as possible, and touch the wall. The difference between standing height and jump height is recorded. Each athlete performs 3 trials, and the highest value is used as the final result. Validity 0.78 and reliability 0.87 (Sargent, 2013).

4. Beep Test (Multi-Stage Fitness Test)

Measures cardiorespiratory endurance. Athletes run back and forth for 20 meters following the rhythm of increasingly rapid beeps. The test is stopped if the athlete can no longer keep up with the rhythm. The final level is converted to a VO_2max value using a standard table. Validity is 0.89 and reliability is 0.95 (Eni, 2021).

Data Collection Procedure

Data was collected in one day using the following procedure:

1. Measurement of basic characteristics (age, height, weight)
2. General warm-up for 15 minutes
3. Push-up test
4. 10-minute rest
5. Back-up test
6. 10-minute rest
7. Vertical jump test
8. 20-minute rest
9. Beep test

Data Analysis

The collected data was analyzed using descriptive statistics to describe the athletes' physical condition profiles. The results of each physical condition component measurement were categorized using the following norms:

Table 2. Push-up test categorization norms (number/minute)

Category	Score Range
Excellent	> 40
Good	31–40
Average	21–30
Poor	11–20
Very Poor	< 11

Table 3. Backup test categorization norms (number/minute)

Category	Score Range
Excellent	> 45
Good	36–45
Average	26–35
Poor	16–25
Very Poor	< 16

Table 4. Vertical jump test categorization norms (cm)

Category	Score Range
Excellent	> 65
Good	56–65
Average	46–55
Poor	36–45
Very Poor	< 36

Table 5. Beep test categorization norms (ml/kg/min)

Category	Score Range
Excellent	> 55
Good	46–55
Average	38–45
Poor	30–37
Very Poor	< 30

To determine the overall physical condition profile, the results of the four tests are added together and categorized using the following norms:

Table 6. Norms for categorizing overall physical condition

Category	Score Range
Excellent	> 80%
Good	66–80%
Average	56–65%
Poor	41–55%
Very Poor	< 40%

5. Result

The following is a description of the physical condition measurements of the Magelang Regency men's volleyball team participating in the PORPROV:

Table 7. Results of physical condition measurements of athletes

Physical Condition Components	Min	Max	Average
Push-ups (number/minute)	25	42	34,64
Back-ups (number/minute)	24	48	35,21
Vertical jump (cm)	44	60	51,86
Beep test (ml/kg/min)	32,4	49,6	41,27

Based on the data in Table 7, it can be seen that the average push-up test result is 34.64 with a standard deviation of 4.85. The average back-up test result is 35.21 with a standard deviation of 6.23. The average vertical jump test result is 51.86 with a standard deviation of 4.89. The average beep test result is 41.27 with a standard deviation of 5.18.

Categorization of Measurement Results

The measurement results for each physical condition component are categorized using established norms. The following is the frequency distribution of the measurement results categorization:

Table 8. Frequency distribution of push-up test categorization

Category	Frequency	Percentage
Very Good	2	14,29%
Good	7	50,00%
Average	5	35,71%
Poor	0	0,00%
Very Poor	0	0,00%
Total	14	100,00%

Table 9. Frequency distribution of backup test categorization

Category	Frequency	Percentage
Very Good	3	21,43%
Good	4	28,57%
Average	6	42,86%
Poor	1	7,14%
Very Poor	0	0,00%
Total	14	100,00%

Table 10. Frequency distribution of vertical jump test categorization

Category	Frequency	Percentage
Very Good	0	0,00%

Category	Frequency	Percentage
Good	4	28,57%
Average	8	57,14%
Poor	2	14,29%
Very Poor	0	0,00%
Total	14	100,00%

Table 11. Frequency distribution of beep test categorization

Category	Frequency	Percentage
Very Good	0	0,00%
Good	4	28,57%
Average	5	35,71%
Poor	5	35,71%
Very Poor	0	0,00%
Total	14	100,00%

Table 12. Frequency distribution of overall physical condition categorization

Category	Frequency	Percentage
Very Good	2	14,29%
Good	5	35,71%
Average	6	42,86%
Poor	1	7,14%
Very Poor	0	0,00%
Total	14	100,00%

Based on the data in the table above, it can be seen that the physical condition profile of the
Magelang Regency men's volleyball team participating in the PORPROV is mostly in the moderate
category (42.86%). Meanwhile, for the physical condition components, arm muscle strength is
mostly in the good category (50%), back muscle strength is mostly in the moderate category
(42.86%), leg muscle power is mostly in the moderate category (57.14%), and cardiorespiratory
endurance is in the moderate and poor categories (35.71% each).

6. Discussion

Arm muscle strength profile
In volleyball, arm muscle strength is a very important basic component because it is involved in
almost all basic techniques such as serving, smashing, passing, and blocking. In this context, sports
are not only physical activities but also part of an active lifestyle that requires muscle strength and
endurance (Hidyatullah, 2023). Research data shows that 50% of male volleyball athletes
participating in the Magelang Regency Pre-PORPROV have arm muscle strength in the good

category, while 35.71% are in the moderate category. (Marques, M. C., González-Badillo, J. J., & Kluka, 2019) state that arm muscle strength has a significant correlation with accuracy and speed when performing smashes. In line with this, (Raihanati & Wahyudi, 2021) emphasize the importance of coaches applying a variety of position-based exercises to optimize motor adaptation. Training programs that are monotonous and do not consider the principle of individualization often result in stagnant strength development (Obompa, 2019).

Furthermore, technical skills such as spikes and smashes are also closely related to the precision of movement formed through functional muscle strengthening, which according to Raihanati & Wahyudi (2021) is one of the important aspects of basic technical skills. (Papadopoulou et al., 2019) also explain that periodic evaluation of muscle strength is very important to monitor athletes' adaptive responses to the training program provided.

Back muscle strength profile
Back muscle strength, especially in the lower back, plays an important role in supporting body stability and energy transfer between the upper and lower body. Based on back-up tests, approximately 42.86% of athletes showed moderate performance. (Willardson, 2007) emphasizes that low core back strength can impact movement efficiency when performing actions such as blocking and jump service.

Unstructured back muscle strengthening exercises will make it difficult to achieve optimal posture when defending or attacking. (Bishop, 2008) suggests an exercise approach that prioritizes core stabilization in order to support explosive movements. Exercises such as back extensions and superman drills can be included in a back strengthening program. Increased back strength also impacts the ability to maintain body position when receiving a ball from an opponent's smash.

Leg muscle power profile
Leg muscle power plays an important role in jumping and landing movements, which are core elements in volleyball. The results of the study show that 57.14% of athletes are in the moderate category in terms of leg muscle power, with an average vertical jump of 51.86 cm. However, according to national standards, elite Indonesian athletes have an average vertical jump of between 58–65 cm (Eni, 2021), and international standards are between 60–70 cm (G. Ziv, 2016). Plyometric training has been proven to significantly improve jumping ability in a relatively short period of time (RamiRez-Campillo et al., 2013). In fact, (Bruno, 2007) states that plyometric training specific to volleyball provides positive results on field performance tests such as the spike test and agility test. (Miller et al., 2006) also adds that improvements in agility and power are more easily achieved through a combination of weight training and integrated plyometric training. (Sargent, 2013) in his classic physical test, emphasized the importance of combining strength and speed in developing good vertical explosive power. Therefore, training programs should not only focus on repetitions without paying attention to the explosive quality of the movements. (Fariz et al., 2019) in their study at the East Java PON also revealed that athletes with high vertical jump scores tend to excel in net games.

Cardiorespiratory Endurance Profile
Cardiorespiratory endurance is an important component in maintaining performance throughout a match. A total of 35.71% of athletes were in the moderate category and another 35.71% in the poor category, with an average VO2max of 41.27 ml/kg/min. This figure is classified as moderate

according to national norms (Wahyu Cirana, Arif Rohman Hakim, 2023) but is still below the average for national athletes (48–52 ml/kg/min) and international athletes (50–55 ml/kg/min) (Palao et al., 2022).

According to (L & Gadoury C, 2016), measuring VO2max through a 20-meter shuttle run test is still a reliable method for evaluating athletes' aerobic endurance. To improve VO2max, exercises such as High Intensity Interval Training (HIIT) and continuous running are recommended (Monks, L., Seo, M. W., Kim, H. B., Jung, H. C., & Song, 2017). (T. J. Gabbett, 2016) reminds us that low aerobic capacity can cause athletes to experience early fatigue, thereby impacting the consistency of their technical and tactical performance.

(Wahyudi, 2024) suggests integrating cooperative learning methods into cardiovascular training to increase athletes' motivation and engagement. This is in line with modern pedagogical approaches that combine social and physical aspects in fitness development. (Ulyasari et al., 2024) also emphasizes that improving smash technique and accuracy also depends heavily on the quality of athletes' stamina.

Analysis of factors affecting physical condition
Age factor
All research subjects were between the ages of 20 and 22. According to (Papadopoulou et al., 2019), this age range represents the peak of physiological development for volleyball athletes. However, findings in the field show that age does not always correlate directly with physical performance, as it is influenced by training quality, motivation, and playing experience.

(Papadopoulou et al., 2019) emphasize that age is only one variable in performance, not the sole factor. Therefore, the training approach should be based on actual performance needs and evaluation, not solely on chronological age.

Anthropometric factors
The average height of athletes is 167.43 cm, which is still far below the ideal height standard for volleyball athletes (185–195 cm) according to (Palao et al., 2014). This condition poses a challenge in net play, especially blocking and spiking. However, (T. Gabbett et al., 2007) shows that shorter players can compensate for their lack of height with greater explosive power.

(Fariz et al., 2019) mention that in the context of local and regional competitions, body posture is not the only indicator of an athlete's success, but it must still be taken into account in long-term training. Anthropometric data, along with technical and physiological performance, form the basis of comprehensive recruitment.

Training program factors
The current training program includes a frequency of 3–4 times per week with a duration of 2–3 hours per session. Of that time, only 30% is allocated to physical training. According to (T. J. Gabbett, 2016), this portion is still insufficient, especially in the initial preparation phase. (Obompa, 2019) emphasizes the importance of the principles of overload, periodization, and individualization in training design so that athletes' physical development is optimal. Unfortunately, many programs have not considered the comprehensive use of physical evaluation data. (Papadopoulou et al., 2019) reminds us of the importance of accurate assessment before designing a training program to avoid

overtraining or undertraining. Strengthening fundamentals, endurance, and technical skills must be done synergistically to create tough and competitive athletes.

5. Conclusion and Recommendation

Based on the results of the research and discussion, it can be concluded that: The physical condition profile of male volleyball athletes participating in the Magelang Regency Pre-PORPROV is mostly in the moderate category (42.86%). The muscle strength profile of the male volleyball athletes participating in the Magelang Regency Pre-PORPROV is mostly in the good category (50%). The back muscle strength profile of the male volleyball athletes participating in the Magelang Regency Pre-PORPROV is mostly in the moderate category (42.86%). The leg muscle power profile of male volleyball athletes in the Magelang Regency Pre-PORPROV is mostly in the moderate category (57.14%). The cardiorespiratory endurance profile of male volleyball athletes in the Magelang Regency Pre-PORPROV is distributed across the good (28.57%), moderate (35.71%), and poor (35.71%) categories. The physical condition components that still require special attention are leg muscle power and cardiorespiratory endurance.

Based on the results of the research, discussion, and conclusions, the following recommendations can be made: for coaches and team managers it is necessary to increase the portion of physical conditioning training, especially for leg muscle power and cardiorespiratory endurance components. training programs should be structured in a more structured, progressive, and specific manner according to the individual needs of athletes. monitoring and evaluation of athletes' physical condition needs to be carried out regularly to determine progress and make adjustments to the training program. For athletes need to increase the intensity and consistency of their training, especially for physical condition components that are still lacking, athletes need to pay attention to supporting aspects such as adequate rest, balanced nutrition, and stress management to support the adaptation process to training.

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