Kinestetik : Jurnal Ilmiah Pendidikan Jasmani 9 (3) (2025)
Kinestetik : Jurnal Ilmiah Pendidikan Jasmani
https://ejournal.unib.ac.id/index.php/kinestetik/index
DOI : 10.33369/jk.v9i3.43190

Survey of Physical Condition of Volleyball Athletes in Central Java after PON XXI 2024 in Aceh - North Sumatra

Siti Habibatun Nisak*[1], Soedjatmiko[2]

[1,2]Affiliation : Sport Coaching Education, Faculty of Sport Science, Semarang State University, Semarang, Indonesia

Article Info

Article History :

Received : July 2025
Revised : September 2025
Accepted : September 2025

Keywords:

Aceh-North Sumatra
Athletes
Physical Contion
Pon Xxi
Volleyball

Abstract

This study aims to determine the physical condition of Central Java bolavoli athletes after the 2024 National Sports Week held in Aceh-North Sumatra. This research is quantitative descriptive research, data obtained from a survey of athletes' physical condition tests organized by the Central Java Indonesian National Sports Committee (KONI) which was held at the Jatidiri Stadium in Semarang on June 12, 2025. The data collection technique in this study is data sampling, where not the entire population is used but based on criteria, namely Central Java volleyball athletes who take part in Long-Term Regional Training. The results of this study indicate that female athletes generally show a more even physical condition and tend to be in the excellent category in almost all aspects tested, such as flexibility, leg power, arm muscle endurance, abdominal muscle endurance, back muscle strength, leg muscle strength, general endurance, agility, and speed. Meanwhile, male athletes showed greater variation in each component of physical condition, with dominance based on the good and excellent categories, but there were also some aspects that were still in the moderate to deficient category. As a result, there are differences in the consistency of physical conditions between male and female athletes that can be taken into consideration in the preparation and planning of more specific and targeted training programs according to the needs of each group.

*Corresponding email : habibatunnisa0404@students.unnes.ac.id

ISSN 2685-6514 (Online)
ISSN 2477-331X (Print)

INTRODUCTION

Based on Law Number 11 of 2022 concerning Sports Article 1 Paragraph 1 states that "Sports are all activities that involve the mind, body, and soul in an integrated and systematic manner to encourage, foster, and develop physical, spiritual, social, and cultural potential" (Raharja, 2019) . In the context of sports, almost all sports require good physical condition as a supporting factor to achieve optimal performance. Thus, physical condition is one of the main components in improving the quality and achievement of athletes. In addition, physical condition is also an important element in planning training programs and can be used as an indicator to measure the improvement of athletes' physical abilities. Athletes who have excellent physical condition tend to be able to follow the training program optimally and perform well when competing. Therefore, good physical condition greatly contributes to the achievement of maximum performance (Syafrial et al,. 2023).

Physical condition is an important aspect in the physical quality, psychological, and functional ability of a person's body in achieving maximum performance in certain sports. For athletes, physical condition has an important role because it is the main basis for learning techniques, strategies, and mental formation (Zafira et al., 2024). Physical condition is one of the most crucial elements in almost all sports. Therefore, physical condition training must be designed in a structured, systematic, and sustainable manner in order to increase the level of physical fitness and support optimal organ function. Every athlete is required to have excellent physical condition components to maintain and improve sporting achievements. In addition, a good physical condition also allows athletes to carry out daily activities with optimal energy (Dameria et al., 2023). Good physical condition has the advantage of achieving better achievements, especially in the field of sports because it has good muscle ability and strength, fast recovery, both after competition or heavy training, and if injured. Physical condition is an integral unit and cannot be separated in the process of improving and maintaining it. In other words, in an effort to improve physical condition, all components that compose it must be developed as a whole, although its implementation can be carried out based on a certain priority scale according to the branch (Kurniawan, 2020). Physical condition components have a significant role in supporting achievement. According to (Syaiful et al., 2024) these components include strength, speed, flexibility, endurance, and coordination. All of these physical aspects need to be improved systematically to support the improvement of abilities in volleyball games. Each component of the physical condition has general and specific characteristics that are interrelated in supporting the achievement of optimal performance (Imam et al., 2023). In addition, good physical condition prevents mental fatigue, improves

concentration, and has good endurance so that it is not easily tired during training or facing heavy and long matches. As is the case when doing volleyball, especially volleyball athletes who are required to have good physical condition.

Volleyball is one of the most popular, competitive and popular sports in many parts of the world. This sport has been widely competed in various official events, both at national and international levels. In Indonesia itself, volleyball is one of the sports that has a regular championship agenda as part of the effort to develop and improve achievement (Azzariru Rizqi Maula, 2024). Volleyball is a sport played by two teams in one field separated by a net, each team has six players (Ikadarny et al., 2023). The game of volleyball is closely related to various aspects, such as physical, technical, tactical, and mental. Among all these elements, physical condition plays a very vital role and is an important factor in almost all sports, especially volleyball. Volleyball athletes are required to have high general endurance or aerobic ability. Every athlete also needs to have various components of optimal physical condition in order to maintain and improve their performance and achievements (Ibrahim et al., 2024). Although volleyball mostly involves anerobic abilities such as serving, smashing, and blocking, aerobic abilities are needed, especially when facing full set games and long matches, such as in National Sports Week (PON) matches.

The XXI National Sports Week (PON) held in Aceh and North Sumatra in 2024 has become a proving ground for athletes from various regions. After the end of PON XXI, the need arose to find out the extent of the physical condition of volleyball athletes who had participated in the event. This knowledge is important for coaches, team administrators and other stakeholders in designing sustainable coaching programs. This knowledge is important for coaches, team administrators, and related parties in designing sustainable coaching programs. In this context, it is important to survey the physical condition of athletes as a basis for evaluation and development of training programs. This survey was conducted to map the physical condition of volleyball athletes who have participated in PON XXI, so that it can be used as a basis for improving athlete performance, preventing injuries, and developing more targeted training strategies in the future.

METHODS

The research method used is descriptive quantitative, and the method used in this research is the survey method with tests and measurements. Quantitative method is a systematic approach used to examine phenomena by collecting data that can be measured numerically and analyzed through statistical, mathematical, or computational techniques (Berlianti et al., 2024). This research is descriptive because it aims to provide an objective picture of the physical condition of volleyball athletes after participating in

the XXI National Sports Week (PON). The quantitative approach is used because the data obtained is in the form of numbers, for example the results of physical fitness measurements such as muscle strength, speed, endurance, agility, and flexibility which are analyzed statistically to obtain valid and reliable interpretations.

Participants

Population is all individuals, objects, or events that are the main subjects in a study (Asrulla et al., 2023). The population in this study are Central Java volleyball athletes who have participated in the PON XXI Aceh-Sumut 2024 event.

Sampling Procedures

The sampling technique used in this study is data sampling, which is a method in which not all members of the population are used as research samples but based on criteria (Firmansyah & Dede, 2022). The sample is part of the population used as a data source in a study, the sample is selected to present the criteria possessed by the entire population so that the results of research on the sample can be generalized to the population (Muhammad Isnaini et al., 2025). The sample in this study were Central Java volleyball athletes who had participated in the PON XXI Aceh-Sumut 2024 event and were registered for the Long-Term Tenagah Java Regional Training (Pelada) from May 1, 2025. The sample of this study were 15 athletes, 8 male athletes and 7 female athletes. Sampling with purposive sampling.

Materials and Apparatus

This research is descriptive research, the method used is a survey method with test techniques and data measurement. Information obtained from survey research from a portion of the population.

In this study, researchers used field test techniques that were adjusted to physical fitness standards. Data was collected through a physical test survey conducted by the Indonesian National Sports Committee (KONI) of Central Java Province on June 11-12, 2025 at the Jatidiri Stadium in Semarang. According to (Sugiyono, 2019) a survey is one type of research approach used to obtain actual data or facts in the field. The main purpose of this approach is to obtain information that is accurate, relevant, and in accordance with the real conditions in the field.

The research instrument used in this study was the Sit and Reach test to measure the flexibility of the lower back muscles and hamstrings with a validity value of 0.719 and a reliability of 0.715 (Sari & Subagio, 2021). Vertical jump test to assess leg muscle explosive power with validity values of 0.97 to 0.99 and reliability of 0.93 to 0.97 (Sattler et al., 2012). Push-ups are used to measure arm muscle endurance with a validity value of 0.83 to 1.00 and a reliability of 0.991 (Siregar et al., 2022). Sit-up test was used to assess abdominal muscle endurance with a validity value of 0.866 and a reliability of 0.557 (Ridwan & Irawan, 2018). Back and Leg dynamometer test is

used to measure back and leg muscle strength statically, the validity value is 0.872 and reliability is 0.63 for Back test (Dhomas Hernandi, 2021) and validity value of 0.601 and reliability of 0.651 for Leg test (Rahadiawan, 2020). 30-meter sprint test to measure linear speed in a short time with a validity value of 0.92 and reliability of 0.94 to 0.98 (Nigro et al., 2017). Quadrant jump measures agility or the ability to move quickly in various directions with a validity value of 0.93 and reliability of 0.89 (Jain et al., 2024). 1600 meter running test to measure the aerobic endurance of athletes with a validity value of 0.756 and reliability of 0.861 (Zhannisa & Sugiyanto, 2015).

Procedures

Data collection in this study was carried out through the implementation of a series of physical fitness tests that had been systematically arranged in order to obtain valid and reliable data. Prior to the implementation of the test, the researcher first carried out the preparation stage, including preparing the necessary equipment, such as stopwatches, mats, measuring rulers, Sit and Reach Box tools, Back and Leg Dynamometer, and a standard running track. In addition, the researcher also gave a thorough explanation to all participants regarding the purpose and procedure of the test. After that, participants were asked to give consent through filling out informed consent. As a preventive measure against the risk of injury, participants warmed up for approximately 10 minutes before starting the test.

Data was collected through eight types of physical fitness tests, namely:

1. Sit and Reach Test: Used to measure flexibility (flexibility), where participants are asked to reach forward as far as possible in a sitting position with both hands, and the results are measured in centimeters.
2. Vertical Jump (Jump DF): Measure the explosive strength of the leg muscles by calculating the difference between the height of the reach when standing and when making a vertical jump.
3. Push-Up Test: Aims to assess arm muscle endurance. This test is performed for one minute and is calculated based on the number of repetitions performed correctly.
4. Sit-Up Test: Measuring abdominal muscle endurance, by recording the number of movements performed correctly for one minute.
5. Back and Leg Dynamometer: Used to measure back and leg muscle strength, with results recorded in kilograms according to the tool indicator.
6. Lari 1600 Meter: Measure the cardiovascular endurance of participants by recording the running time in minutes and seconds.
7. Quadrant Jump Test: Measures agility by asking participants to jump following a certain pattern for 10 seconds, then the number of valid jumps is counted.

8. Sprint 30 Meter: Measuring running speed, with travel time measured using a stopwatch.

The entire series of tests was carried out under direct supervision by the researcher and assisted by field assistants to ensure that each procedure was carried out in accordance with predetermined standards. The data obtained from this process was systematically recorded and then analyzed and used as a basis for describing the research findings.

Design or Data Analysis

The data that has been collected is then processed and analyzed through several stages. The analysis technique used in this research is descriptive analysis, which includes the calculation of the average value, standard deviation, lowest and highest values. In addition, the data were analyzed using percentage techniques, classified into certain categories, and presented in the form of descriptive descriptions to facilitate interpretation of the results.

RESULT

The research data that has been obtained is then processed and presented through tables and figures.

1. Flexibility Test Analysis Result

	men		women	
	cm	inches	cm	inches
super	> +27	> +10.5	> +30	> +11.5
excellent	+17 to +27	+6.5 to +10.5	+21 to +30	+8.0 to +11.5
good	+6 to +16	+2.5 to +6.0	+11 to +20	+4.5 to +7.5
average	0 to +5	0 to +2.0	+1 to +10	+0.5 to +4.0
fair	-8 to -1	-3.0 to -0.5	-7 to 0	-2.5 to 0
poor	-20 to -9	-7.5 to -3.5	-15 to -8	-6.0 to -3.0
very poor	< -20	< -7.5	< -15	< -6.0

Figure 1. Sit and Reach Test Norm

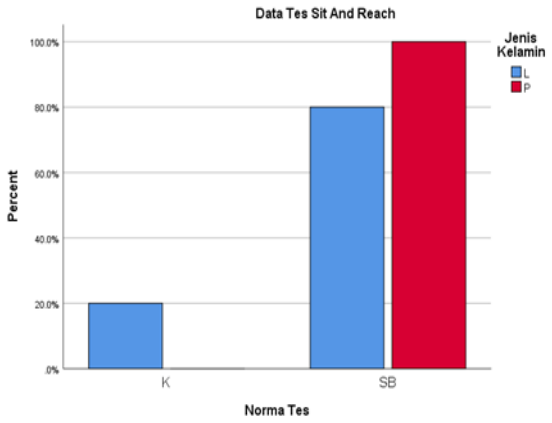

Figure 2 Percentage diagram of Determination Test Results

Based on sit and reach test data by Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra and following Regional Training processed using SPSS 25 based on sit and reach test norms, the data shows L is a male gender athlete and P is a female gender athlete. then SB = Very Good and K = Less. Based on the data above, it shows that male athletes have a physical condition of very good flexibility (SB) of 80% and less (K) of 20% and for female athletes 100% have a physical condition of very good flexibility (SB).

2. Limb Power Test Analysis Results

Table 1. DF Jump Test Norm

Category	Men	Women
Very Good	>70	>70
Good	61-70	51-60
Fair	51-60	41-50
Moderate	41-60	31-40
Poor	31-40	21-30
Very Poor	>30	>20

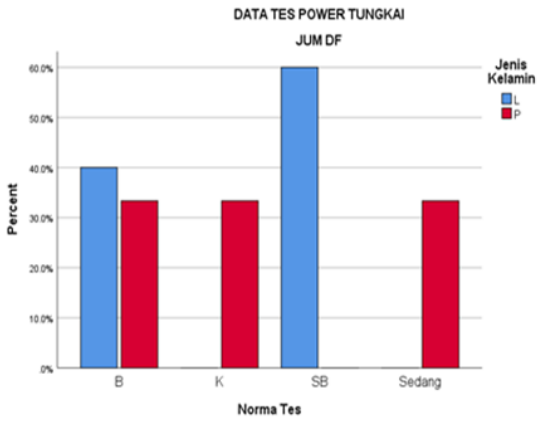

Figure 3 Percentage diagram of Arm Muscle Endurance Test Results

Based on the results of data processing of the jump df leg power test using SPSS 25.0 data shows that athletes with male gender have a physical condition of 60% Very Good (SB) and 40% Good (B), then for female athletes have a physical condition of leg power based on the jump df test showing 33.3% Very Good (SB), 33.3% Good (B), and 33.3% Less (K).

3. Arm Muscle Endurance Test Analysis Results

Table 2. Push Up Test Norms

Category	Men	Women
Very Good	>46	>35
Good	36-45	25-34
Fair	26-35	15-24
Moderate	16-25	5-14
Poor	<15	>4

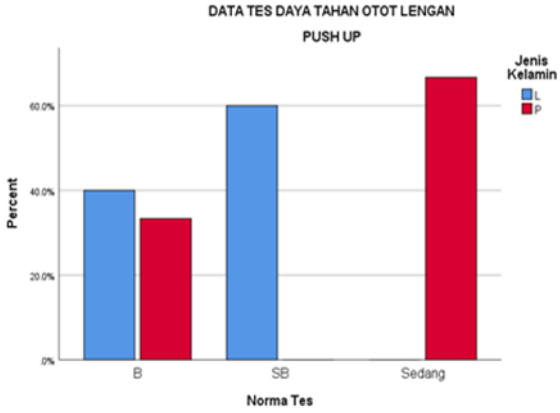

Figure 4. Percentage diagram of Arm Muscle Endurance Test Results

Based on the results of data processing research on the physical condition of the push up arm muscle endurance test conducted by Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra, it shows that male athletes have a physical condition of arm muscle endurance 60% Very Good (SB) and 40% Good (B). For female athletes, the physical condition of arm muscle endurance shows 66.7% Very Good (SB) and 33.3% Good (B).

4. Abdominal Muscle Endurance Test Analysis Results

Table 3. Sit Up Test Norms

Category	Men	Women
Very Good	>49	>43
Good	44-49	37-422
Fair	39-43	33-36
Moderate	35-38	29-32
Poor	31-34	25-28
Very Poor	>49	>43

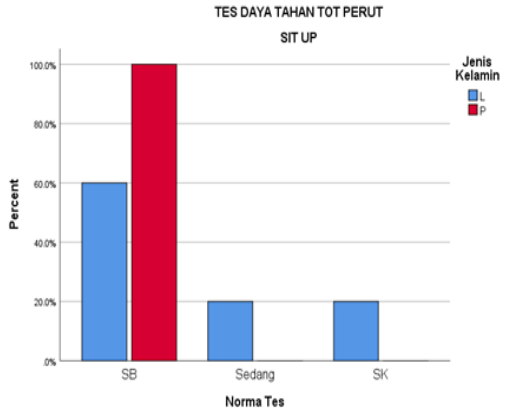

Figure 5 Diagram of the percentage of Abdominal Muscle Endurance Test Results

Based on the results of data processing research on the physical condition of the sit-up abdominal muscle endurance test conducted by Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra, it shows that male athletes have a physical condition of abdominal muscle endurance 60% Very Good (SB), 20% Good (B), and 20% Very Less (SK). For female athletes, the physical condition of abdominal muscle endurance shows 100% Very Good (SB).

5. Back and Limb Muscle Strength Test Analysis Results

Table 4. Norma Tes Back Dynamometer

Category	Men	Women
Very Good	>49	>43
Good	44-49	37-422
Fair	39-43	33-36
Moderate	35-38	29-32
Poor	31-34	25-28

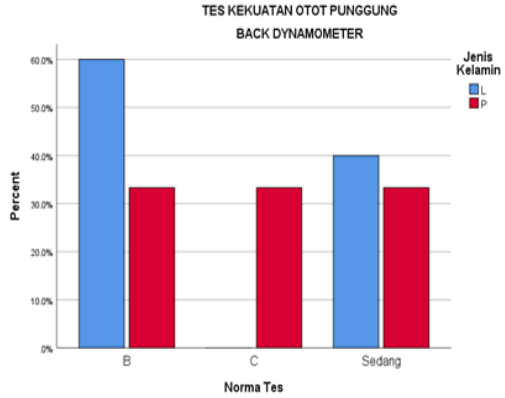

Figure 6. Diagram of the percentage of Back Muscle Strength Test Results

Based on the results of data processing research on the physical condition of the back dynamometer back muscle strength test conducted by Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra, it shows that male athletes have a physical condition of 60% Good back muscle strength (B) and 40% Moderate. For female athletes, the physical condition of back muscle endurance shows 33.3% Good (B), 33.3% Moderate, and 33.3% Fair (C).

Table 5 Norma Tes Leg Dynamometer

Category	Men	Women
Very Good	<259,5	<219,5
Good	187,5-187	171,5-219
Fair	127,5-187	127,5-171
Moderate	54,5-127	81,5-127
Poor	>84	>81

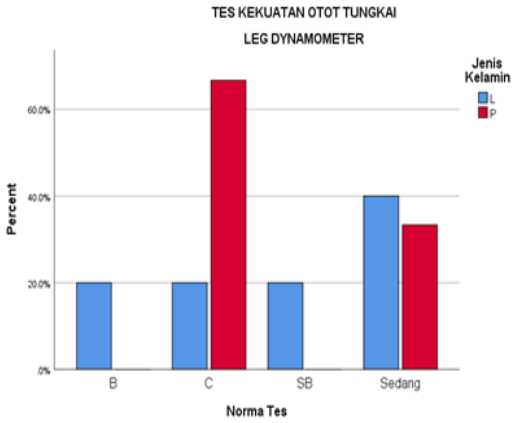

Figure 7 Diagram of the percentage of Leg Muscle Strength Test Results

Based on the results of data processing research on the physical condition of the leg dynamometer leg muscle strength test conducted by Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra, it shows that male athletes have a physical condition of leg muscle strength of 20% Very Good (SB), 20% Good (B), 20% Fair (C) and 40% Moderate. For female athletes, the physical condition of leg muscle strength shows 66.7% Moderate and 33.3% Fair (C).

6. Speed Test Analysis Results
Table 6. Norma Tes Sprint 30meter

Category	Men	Women
Very Good	4.00-4.64	4.72-5.92
Good	4.65-5.31	5.93-7.14
Fair	5.32-5.96	7.15-8.34
Poor	5.97+	8.35+

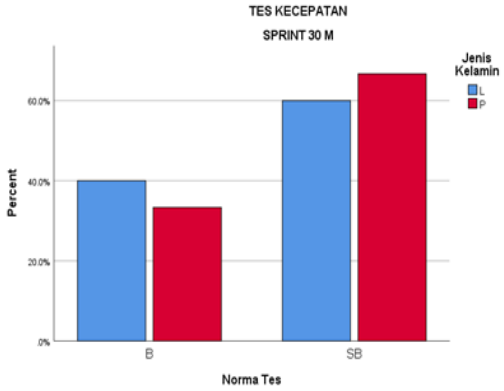

Figure 8 Diagram of the percentage of Speed Test Results

Based on the results of data processing research on the physical condition of the 30-meter sprint speed test conducted by Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra, it shows that male athletes have a physical condition of 60% Very Good (SB) speed and 40% Good (B). For female athletes, the physical condition of speed shows 66.7% Very Good (SB) and 33.3% Good (B).

7. Agility Test Analysis Results
Table 7.Norma Tes Quadrant Jump

Category	Men	Women
Very Good	31+	33+
Good	25-30	27-32
Fair	13-24	14-26
Moderate	7-12	8-13
Poor	0-6	0-7

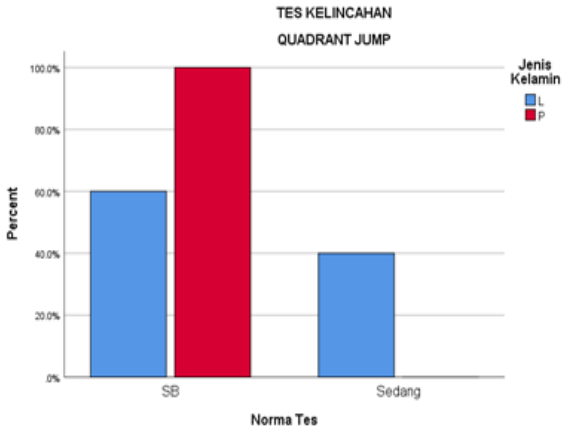

Figure 9. Diagram presentase Hasil Tes Kelincahan

Based on the results of data processing research on the physical condition of the quadrant jump agility test conducted by Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra, it shows that male athletes have 60% Good (SB) agility physical condition and 40% Moderate. For female athletes, the physical condition of agility shows 100% Very Good (SB).

8. Endurance Test Analysis Results

Tabel 1. Norma Tes Daya Tahan

Category	Men	Women
Very Good	<10.45	<13.30
Good	10.46-12.00	13.31-15.54
Fair	12.01-14.00	15.55-18.00
Moderate	14.01-16.00	18.01-19.00
Poor	>16.01	>19.01

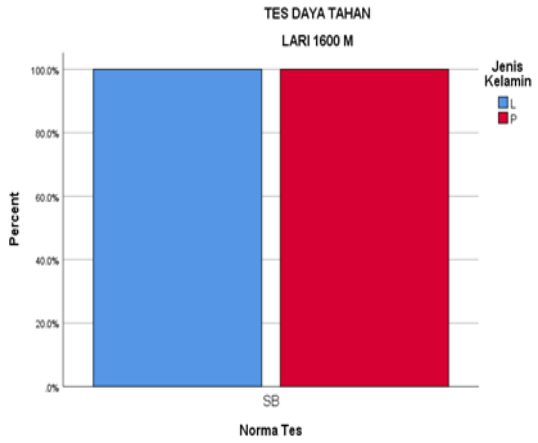

Figure 10. Diagram presentase *Hasil Tes Daya Tahan*

Based on the results of data processing research on the physical condition of the 1600meter running endurance test conducted by Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra, it shows that male athletes have a physical condition of endurance of 100% Good (SB) and for female athletes the physical condition of endurance shows 100% Very Good (SB).

DISCUSSION

Based on the results of a survey of the physical condition of Central Java volleyball athletes after PON XXI 2024 in Aceh-North Sumatra and joining the Long-Term Regional Training, the test results include aspects of flexibility, leg muscle power, muscle endurance, muscle strength, speed, agility, and aerobic endurance. Data were analyzed using SPSS 25.0 using national standard norms.

1. Determination (Sit and Reach)
   The results showed 80% of male athletes had a level of determination in the Very Good category, while 20% were in the Poor category. In contrast,

all female athletes (100%) were recorded in the Very Good category. The high level of flexibility in female athletes is thought to be influenced by biological factors such as joint structure, muscle elasticity, and a training approach that focuses more on developing flexibility. In the context of volleyball games, optimal flexibility greatly supports the player's ability to reach low balls and prevent the risk of injury due to limited range of motion. This finding is consistent with research (Romadhonsyah, 2024) which revealed that flexibility, especially in the wrist, plays a significant role in supporting the effectiveness of smash in volleyball games.

2. Limb Muscle Power (Jump DF)
   Most male athletes obtained results in the Very Good (60%) and Good (40%) categories. In contrast, the distribution in female athletes tends to be evenly distributed, namely 33.3% each in the Very Good, Good, and Lack categories. This data suggests that male athletes' leg muscle explosive power is relatively more consistent and high, which is very important in supporting jumping techniques to perform blocks and smashes. The variation in results in female athletes indicates a need for improvement through explosive training methods such as plyometric training and resistanc training (Nanda Saputra et al., 2023). This is reinforced by the results of research in, which states that leg muscle explosiveness is one of the main factors that affect accuracy and strength in smash (Putra, 2019).
3. Arm Muscle Endurance (Push-Up)
4. Most athletes, both male and female, were in the Good to Very Good category, indicating adequate arm muscle endurance capacity. Arm muscle endurance is a crucial component in maintaining stroke quality and consistency during the match, especially in activities that require repetitive movements such as serving and blocking (Saptiani et al., 2019).
5. Abdominal Muscle Endurance (Sit-Up)
   A total of 60% of male athletes were in the Very Good, 20% Good, and 20% Very Poor categories. Meanwhile, all female athletes (100%) showed results in the Very Good category. Core muscle ability, especially the abdominal muscles, greatly affects body stability and movement control when performing various dynamic activities such as jumping, body rotation, and landing. This difference in performance between the sexes indicates the need for more focused core muscle strengthening in the male athlete group because smash is the ultimate technique to get points. (Oktariana & Hardiyono, 2020).
6. Back and Leg Muscle Strength (Back and Leg Dynamometer)
   For back muscle strength, the majority of male athletes (60%) were in the Good category, while the other 40% were Moderate. Female athletes showed more even results with distributions in the Good, Moderate, and Fair categories. In terms of leg muscle strength, male athletes showed a wider variation-20% Very Good, 20% Good, 20% Fair, and 40%

Moderate-while female athletes were dominated by the Moderate (66.7%) and Fair (33.3%) categories. These results indicate the need for more systematic and sustainable strength training interventions, with a focus on strengthening postural and leg muscles to support stability and propulsion when jumping (Astriani et al., 2023).

7. Speed (30 Meter Sprint)
   Most athletes, both male and female, scored in the Very Good category. This reflects optimal acceleration ability, which is an important aspect of modern volleyball, especially for dealing with changes in game tempo, responding to opponent's serve balls, as well as making quick transitions between positions. Speed is critical to success in dynamic game situations that require instant reactions (Shanty et al., 2021).
8. Agility (Quadrant Jump)
   All female athletes (100%) showed results in the Very Good category, while male athletes obtained results of 60% in the Good category and 40% Moderate. These results indicate that female athletes have better coordination of motion and body control in lateral movements and sudden changes in direction. Good agility is essential in the game of volleyball to support quick responses to the ball and positional flexibility during defense and attack (Gong, Z., Li, F., & Zhang, 2021) .
9. Aerobic Endurance (1600 Meter Run)
   Female athletes showed very optimal results with 100% in the Very Good category, while male athletes were in the Good category overall. Good aerobic endurance reflects the working efficiency of the cardiovascular system in supporting sustained physical activity. In the context of volleyball, high aerobic capacity helps players maintain game intensity without experiencing excessive fatigue. This finding is in line with the results of research (Puspodari, 2021), emphasizes the importance of neuro-athletic training and increasing VO_2 max capacity as a foundation for endurance in fast and reactive sports such as volleyball.

CONCLUSION

Based on the results of research on various components of the physical condition of Central Java volleyball athletes after PON XXI 2024 in Aceh-Sumatra which includes flexibility, leg strength, arm muscle endurance, abdominal muscle endurance, back muscle strength, leg muscle strength, general endurance, agility and speed, it can be concluded that there are significant differences between male and female athletes. In general, female athletes show a more consistent and dominant level of physical fitness in the excellent category in most aspects tested. This can be seen in the ability of flexibility, abdominal muscle endurance, agility and speed which are at the optimal level without the distribution of values in the low or less category. This consistency shows that female athletes in the group studied have a relatively stable physical condition and are ready to support maximum sports performance.

In contrast, male athletes showed greater variation in various aspects of physical fitness. Although male athletes tended to be in the good to excellent category in some components, such as arm muscle endurance and speed, there were also other aspects such as flexibility, leg muscle strength and abdominal muscle endurance that showed a distribution of values categorized as moderate or even very poor.

This imbalance indicates a difference in The level of physical condition mastery in each male athlete, which could potentially affect overall performance if not carefully evaluated and improved. The difference between the two groups indicates that the training program applied can have a different impact on each gender group, or there are differences in physiological responses to training. Therefore, it is recommended that coaches and support teams make adjustments and personalization in physical training planning based on the specific needs and conditions of each athlete. With a more individualized and targeted approach, it is hoped that the performance of male and female athletes can be improved optimally and evenly in all components of physical condition.

ACKNOWLEDGEMENT

The researcher would like to express her deepest gratitude to all those who have provided support, assistance, and contributions in the implementation and completion of this research.

REFERENCES

Asrulla, Risnita, Jailani, M. S., & Jeka, F. (2023). Populasi dan Sampling (Kuantitatif), Serta Pemilihan Informan Kunci (Kualitatif) dalam Pendekatan Praktis. *Jurnal Pendidikan Tambusai*, *7*(3), 26320–26332.

Astriani, F., Tuti Ariani, N. L. P., & Happy Kardiawan, I. K. (2023). Hubungan Kekuatan Otot Perut Dan Power Otot Lengan Dengan Ketepatan Servis Atas Pada Atlet Putri Club Satrya Kelana Wuryantoro. *Jurnal Pendidikan Kepelatihan Olahraga Undiksha*, *12*(1), 24–29. https://doi.org/10.23887/jjpko.v12i1.61952

Azzariru Rizqi Maula, A. A. (2024). Pembinaan Prestasi Olahraga Bola Voli Di Klub Satria Sejati Kota Semarang Tahun 2024. *Journal of S.P.O.R.T*, *8*(2), 449–472. https://doi.org/doi.org/10.37058/sport

Berlianti, D. F., Abid, A. Al, & Ruby, A. C. (2024). Metode Penelitian Kuantitatif Pendekatan Ilmiah untuk Analisis Data. *Jurnal Review Pendidikan Dan Pengajaran*, *7*(3), 1861–1864.

Dameria, F. D., Permono, P. S., & Yudhistira, D. (2023). Analisis teknik dasar dan kondisi fisik pemain bulutangkis usia 11-13. *MULTILATERAL: Jurnal Pendidikan Jasmani Dan Olahraga*, *22*(2), 94–103. https://doi.org/10.20527/multilateral.v22i2.15251

Dhomas Hernandi, P. (2021). Tingkat Kemampuan Kondisi Fisik Kekuatan pada Atlet Bola Voli Putra di Club IVOKAS Kabupaten Semarang Tahun 2018. *Unner Journal of Sport Sciences*, *5*(1), 34–43.

https://journal.unnes.ac.id/sju/index.php/ujss/index

Firmansyah, D., & Dede. (2022). Teknik Pengambilan Sampel Umum dalam Metodologi Penelitian: Literature Review. *Jurnal Ilmiah Pendidikan Holistik (JIPH)*, *1*(2), 85–114. https://doi.org/10.55927/jiph.v1i2.937

Gong, Z., Li, F., & Zhang, Y. (2021). Dampak Latihan Lompat Tali terhadap Kelincahan dan Kecepatan Atlet Muda. *Jurnal Internasional Ilmu Olahraga*, *13*(4), 286–295.

Ibrahim, I., Hidayat, R. R., Kadir, S. S., Kardi, I. S., Nopiyanto, Y. E., & Kurdi, K. (2024). Profil Kesehatan Mental Atlet National Paralympic Committe National (Npc) Papua. *Jambura Journal of Health Sciences and Research*, *6*(1), 23–33. https://doi.org/10.35971/jjhsr.v6i1.21150

Ikadarny, Sutriawan, A., Syafruddin, M. A., & Haeril. (2023). Analisis Kemampuan Servis Bawah Pada Permainan Bola Voli. *Jurnal Ilmiah STOK Bina Guna Medan*, *11*(1), 39–44. https://doi.org/10.55081/jsbg.v11i1.809

Imam, K., Untung, M., & Lajau, M. L. (2023). Hubungan Kekuatan Otot Tungkai dan Kecepatan Terhadap Kelincahan pada Anggota Persatuan Bulutangkis Di Ngemplak, Sleman. *Jurnal Ilmu Kesehatan Bhakti Husada: Health Sciences Journal*, *14*(02), 293–298. https://doi.org/10.34305/jikbh.v14i02.834

Jain, V., Patil, S., Khandare, B., Lakdawala, N., & Education, M. C. (2024). Intra-Rater And Inter-Rater Reliability of Quadrant Jump Test for Assessing Agility In Football Players: A Cross-Sectional Study. *International Journal Of Novel Research And Development*, *9*(6), 275–290.

Kurniawan, A. (2020). Survei Tingkat Kondisi Fisik Pebulutangkis Kelompok Usia 10-12 Tahun di Pb. Sunrise Tahun 2019. *Journal of Sport Coaching and Physical Education*, *5*(1), 24–29. https://doi.org/10.15294/jscpe.v5i1.36810

Muhammad Isnaini, Muhammad Win Afgani, Al Haqqi, I. A. (2025). Teknik Analisis Data Uji Normalitas ANOVA. *J-CEKI : Jurnal Cendekia Ilmiah*, *4*(2), 1377–1384.

Nanda Saputra, Aziz, I., Syafruddin, S., Susanto, N., & Damrah, D. (2023). Pengaruh Daya Ledak Otot Lengan Daya Ledak Otot Tungkai Dan Koordinasi Mata-Kaki Terhadap Ketepatan Smash Bolavoli Siswa Putra SMKN 2 Pariaman. *Wahana Didaktika : Jurnal Ilmu Kependidikan*, *21*(1), 167–182. https://doi.org/10.31851/wahanadidaktika.v21i1.11096

Nigro, F., Bartolomei, S., & Merni, F. (2017). Validity of Different Systems for Time Measurement in 30M-Sprint Test. *Engineering, Medicine*, *1*(1), 104–108.

Oktariana, D., & Hardiyono, B. (2020). Pengaruh Daya Ledak Otot Lengan, Daya Ledak Otot Tungkai Dan Kekuatan Otot Perut Terhadap Hasil Smash Bola Voli Pada Siswa SMK Negeri 3 Palembang. *Journal Coaching Education Sports*, *1*(1), 13–24. https://doi.org/10.31599/jces.v1i1.82

Puspodari. (2021). Tingkat Volume Oksigen Maksimal Atlet Cabor Konsentrasi Unggulan Senam Puslatkot Kota Kediri Dalam Menghadapi Pekan Olahraga Provinsi 2022. *Jurnal Kejaora (Kesehatan Jasmani Dan Olah*

Raga), *6*(1), 207–211. https://doi.org/10.36526/kejaora.v6i1.1296

Putra, R. (2019). Kontribusi Daya Ledak Otot Lengan, Kelentukan Dan Koordinasi Mata-Tangan Terhadap Ketepatan Smash Atlet Bulutangkis Pb. Bintama Kerinci. *Ensiklopedia of Jurnal*, *1*(3), 233–238.

Rahadiawan, A. putra. (2020). Hubungan Antara Kekuatan Otot Tungkai, Daya Ledak Otot Tungkai dan Koordinasi Mata Kaki Terhadap Jauhnya Tendangan pada Tim Sepakbola SMPN 2 Pucanglaban Kabupaten Tulungagung Angger. *Bravo's : Jurnal Program Studi Pendidikan Jasmani Dan KesehatanJurnal Program Studi Pendidikan Jasmani Dan Kesehatan*, *08*(02), 51–61. https://doi.org/10.32682/bravos.v8i2.1504 Abstrak

Raharja, D. S. P. (2019). Model Pendidikan Olahraga Dalam Meningkatkan Sikap Sportivitas. *Journal of SPORT (Sport, Physical Education, Organization, Recreation, and Training)*, *3*(1), 29–36. https://doi.org/10.37058/sport.v3i1.748

Ridwan, M., & Irawan, R. (2018). Validitas Dan Reliabilitas Tes Kondisi Fisik Atlet Sekolah Sepakbola (Ssb) Kota Padang "Battery Test Of Physical Conditioning." *Jurnal Performa*, *3*(2), 90–99. https://doi.org/10.24036/JPO17019

Romadhonsyah, A. (2024). Contribution of Arm Muscle Power and Body Flexibility Regarding Volleyball Services for Athletes. *Multidisciplinary Journal of Tourism, Hospitality, Sport and Physical Education*, *1*(1), 1–5. https://doi.org/10.37251/jthpe.v1i1.1032

Saptiani, D., Sugiyanto, S., & Syafrial, S. (2019). Hubungan Kekuatan Otot Lengan Dan Koordinasi Mata Tangan Terhadap Akurasi Servis Atas Bola Voli Pada Peserta Putri Ekstrakurikuler Di Sman 2 Seluma. *Kinestetik*, *3*(1), 42–50. https://doi.org/10.33369/jk.v3i1.8810

Sari, M. P., & Subagio, I. (2021). Analisis Butir Item Tes Fisik Bolavoli Putri Puslatda Jatim 100-IV. *Jurnal Prestasi Olahraga*, *4*(2), 29–37.

Sattler, T., Sekulic, D., Hadzic, V., Uljevic, O., & Dervisevic, E. (2012). Vertical jumping tests in volleyball: Reliability, validity, and playing-position specifics. *Journal of Strength and Conditioning Research*, *26*(6), 1532–1538. https://doi.org/10.1519/JSC.0b013e318234e838

Shanty, E., Ridwan, M., Argantos, A., & Setiawan, Y. (2021). Kontribusi Kekuatan Otot Lengan, Kekuatan Otot Tungkai dan Kekuatan Otot Punggung terhadap Kecepatan Renang Gaya Bebas 50 Meter. *Jurnal Patriot*, *3*(1), 179–191.

Siregar, Y. E., Mardela, R., Aziz, I., Irawan, R., & Arifan, I. (2022). Uji Validitas Dan Reliabilitas Instrumen Tes Kekuatan Push-Up Berbasis Digital. *Gladiator*, *2*(5), 198–206. https://doi.org/10.24036/gltdor121011

Sugiyono, D. (2019). Metode penelitian kuantitatif kualitatif dan R&D. In *Penerbit Alfabeta*.

Syafrial, Nopiyanto, Y. E., Insanistyo, B., Indriani, T., Kardi, I. S., & I. (2023). Analisis Kondisi Fisik Atlet Atletik Putra di Pusat Pendidikan Latihan Pelajar Provinsi Bengkulu. *Journal of SPORT (Sport, Physical Education, Organization, Recreation, and Training)*, *7*(3), 693–703.

Syaiful, W., Irawadi, H., & Arifan, I. (2024). *Tinjauan Kondisi Fisik Dan Teknik Dasar Siswa Sekolah Sepak Bola (SSB)*. 787–799.

Zafira, N., Rani, A., & Candra, D. (2024). The relationship between mental toughness, anxiety with the achievement motivation adolescent badminton athlete. *Jurnal Patriot*, *6*(3), 89–96. https://doi.org/doi.org/10.24036/patriot.v%vi%i.1078

Zhannisa, U. H., & Sugiyanto, F. (2015). Model Tes Fisik Pencarian Bakat Olahraga Bulutangkis Usia Di Bawah 11 Tahun Di Diy. *Jurnal Keolahragaan*, *3*(1), 117–126. https://doi.org/10.21831/jk.v3i1.4974