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Afnan Wijayanto
Faculty of Sport and Health Sciences, Yogyakarta State University, Yogyakarta, Indonesia

Endang Rini Sukamti
Faculty of Sport and Health Sciences, Yogyakarta State University, Yogyakarta, Indonesia

Corresponding Author:
Afnan Wijayanto
Faculty of Sport and Health Sciences, Yogyakarta State University, Yogyakarta, Indonesia

Analysis of the physical condition of men's volleyball athletes at PBV Mutiara Sleman regency

Afnan Wijayanto and Endang Rini Sukamti

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Abstract
This study aims to analyze the physical condition of PBV Mutiara volleyball male athletes consisting of coordination, arm power, limb power, agility, speed, flexibility, arm muscle strength, and VO_2Max endurance. This research is a quantitative descriptive study. The research population was all male volleyball athletes at PBV Mutiara, totaling 40 players. The sampling technique used total sampling. The coordination instrument is the tennis ball throwing test, arm power is the basketball throwing test, limb power is the vertical jump, agility is the Illinois Agility Test, speed is the 40 meter running test, flexibility is the sit and reach test, arm muscle strength is push up and VO_2Max endurance is the multistage fitness test. Data analysis is independent sample t test. The results showed that coordination 46.50% (19 athletes) and agility 60.00% (24 athletes) in the good category. Arm power 42.50% (17 athletes), limb power 55.00% (22 athletes), flexibility 57.50% (athletes), arm muscle strength 27.50% (14 athletes), and VO2Max 42.50% (17 athletes) in the average category. Speed 30.00% (12 athletes) in the fair category.

Keywords: Physical condition, volleyball, PBV Mutiara

1. Introduction
Physical condition is closely related to the world of sports, because without a good physique an athlete will find it difficult to maximize technical abilities. The formation of physical conditions is a fundamental component in addition to technical, tactical and mental preparation in various sports. This is in accordance with what is revealed by Purnama & Ni'am (2021, p. 57) [1] which suggests that maintenance of physical condition must be carried out in accordance with the desired dose. Physical condition is very decisive for someone to optimize the techniques learned, good physical condition is the main requirement for mastering and developing a sports technique skill.
The components of physical condition that affect volleyball achievement according to Kadafi & Irsyada (2021, p. 128) [2] include: strength, speed, flexibility, endurance, and coordination. The physical condition must be improved so that the ability to play volleyball is maximized. The components of physical conditions have general and specific characteristics to obtain achievements in volleyball.
Hand-eye coordination is a motion caused by information integrated in various movements in the body (Darmawan, *et al*., 2020, p. 861) [3]. Hand movements can be visually controlled which are adjusted to the planned sequence of motion in volleyball lower passing (Ikadarny & Karim, 2020, p. 65) [4]. Lower passing motion techniques or other techniques require a series of inputs to be seen, these inputs are inputted as outputs into motor movements, so that the result is a flexible coordinated movement (Nasriani & Mardela, 2019, p. 876) [5].
Pratama & Nawawi (2020, p. 549) [6] suggest that speed is a conditional ability to produce body movements in the shortest possible circumstances or time. Speed is measured by units of distance divided by an ability to produce body movements in the shortest possible time. In addition, speed is defined as the rate of motion, can apply to the body as a whole or body parts (Dahrial, 2018, p. 2) [7]. In a volleyball game, speed is very much needed, because a hard ball sliding very fast from the opponent requires high speed to reach it before the ball touches the floor.

Strength is the ability to develop maximum force with maximum contraction to overcome resistance or stress (Oktariana & Hardiyono, 2020, p. 14) [8]. Most sporting performances involve movements that are due to the strength capabilities created by muscle contractions. Muscle contractions are used to produce internal forces that regulate the movement of body parts such as the arm muscles (Hakim, 2021, p. 235) [9].

Limb power in volleyball is useful when players will make jump smashes and blocks. Power is the product of strength and speed (Hermanzoni, 2020, p. 654) [10]. The muscle explosiveness produced by limb muscle power affects the transfer of horizontal to vertical momentum. This will be affected by the thrust resulting from changes in momentum, because the characteristic of jumping is that the repulsion movement must be carried out by directing muscle explosive power. Power is an element of energy that is very much needed in various sports, especially volleyball, although not all sports require power as the main energy component.

Volleyball is a very dynamic game. The ball coming from the opponent's direction does not always fall right in front of the player, it can be on the side, behind, or far in front. Agility is heavily influenced by body mass index. Agility is the ability to change body position quickly while moving quickly, without losing balance to body position (Maizan & Umar, 2020, p. 145) [11].

Flexibility is the ability of a joint to move with full Range of Motion (ROM), easily, without resistance and pain. Flexibility is the ability of a joint, muscles and surrounding ligaments to move freely and comfortably within the maximum expected range of motion (Moriyasu, *et al*., 2018, p. 377) [12]. Flexibility is the ability of a joint to move in accordance with its joint space (Sriwahyuniati & Wicaksono, 2021, p. 292) [13]. Volleyball players need a high level of flexibility to make movements that are difficult to reach.

Endurance is an important component in volleyball besides the components mentioned above. Endurance is a person's ability to use their muscles to contract continuously for a relatively long time with a certain load (Prayoga & Wahyudi, 2021, p. 10) [14]. A player can be said to have good endurance when he is not easily tired or continues to move in a state of fatigue.

PBV Mutiara is an active volleyball club in Sleman Regency. This can be seen after the author found out that athletes do regular training every week. In addition, PBV Mutiara also has adequate facilities and infrastructure, such as a training ground and training equipment that is quite complete. These two clubs are also active in participating in competitions held in the city of Sleman especially for the junior class. Based on the results of interviews with coaches, it is stated that the problems that athletes often face when competing often experience fatigue, so that the techniques possessed by athletes cannot be maximally released. Another problem is that during training, athletes often complain of feeling tired even though the training has not been completed.

The importance of the state of physical condition should be realized by the coaches and athletes themselves. The coach should always control the state of the athlete's physical condition, so that it can be known early on if the player experiences a disturbance which will affect the performance of the player's achievements and appearance in competition. This is possible because the ability of a coach has not properly monitored the physical condition of his athletes and there is no data on the athlete's physical condition. Without serious physical condition preparation an athlete will have difficulty in achieving optimal performance during the match.

2. Materials and methods

This research is a descriptive quantitative research. According to (Sugiyono, 2017, p. 7) [15] quantitative research can be interpreted as a research method based on the philosophy of positivism, used to research on certain populations or samples, data collection using research instruments, data analysis is quantitative / statistical, with the aim of testing predetermined hypotheses. Descriptive research is a research method to describe a research result (Ramdhan, 2021, p. 7) [16]. The aim is to provide an explanation of the phenomenon being studied.

The population in this study were all male volleyball athletes at PBV Mutiara. The sampling technique used is total sampling. Total sampling is a sampling technique where the number of samples is the same as the population (Sugiyono, 2019, p. 97) [17].

Research instruments are tools that researchers use and choose in their activities to collect so that these activities become systematic and easier (Arikunto, 2019, p. 134) [18]. The instruments used are as follows:

a. Hand eye coordination was measured using the tennis ball throw-catch test by throwing 30 times, right hand 15 times and left hand 15 times then summed up. The tennis ball throw-catch test has a test validity of 0.92 and a test reliability of 0.835. (Hermawan & Rachman, 2018, p. 102) [19].
b. Arm power is measured using a basketball throwing test. The basketball throwing test has a validity value of 0.989 and a reliability value of 0.979 (Bafirman & Wahyuni, 2019, p. 90) [20].
c. Limb muscle power is measured using a vertical jump test with centimeter units. The instrument has a validity of 0.978 and a reliability of 0.989 (Bafirman & Wahyuni, 2019, p. 109) [21].
d. Agility measured using Illinois Agility This test has a test validity level of 0.99 and a reliability level of 0.89 (Mubarok, 2018, p. 304) [22].
e. Speed is measured by the 40 meter run test with units of seconds. Validity is 0.872 and reliability is 0.891 (Bafirman & Wahyuni, 2019, p. 88) [23].
f. Flexibility is measured using the sit and reach test. sit and reach has a validity of 0.978 and a reliability of 0.989 (Pasaribu, 2020, p. 32) [24].
g. Arm muscle strength was measured using the push up test. The push-up test has a validity of 0.965 and a reliability of 0.982 (Liani, 2018, p. 8) [25].
h. VO_2Max endurance is measured using the multistage fitness test. Validity is 0.78. reliability is 0.86 (Bintoro & Nugraheningsih, 2021, p. 27) [26].

In this study using data analysis methods with statistical calculations. The formula used is as follows:

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

Description:
P = Percentage sought (Relative Frequency)
F = Frequency
N = Number of Respondents

In this study, how to calculate the norm on athlete data is

explained in the table as follows:

Table 1: Norma Penelitian

No	Interval	Category
1	Mi + 1,8 Sbi < X	Excellent
2	Mi + 0,6 Sbi < X ≤ Mi + 1,8 Sbi	Good
3	Mi - 0,6 Sbi < X ≤ Mi + 0,6 Sbi	Average
4	Mi - 1,8 Sbi < X ≤ Mi – 0,6 Sbi	Fair
5	X ≤ Mi - 1,8 Sbi	Poor

3. Results & Discussion

Descriptive results of physical condition data consisting of coordination, arm power, limb power, agility, speed, flexibility, arm muscle strength, and VO_2Max endurance of Mutiara PBV athletes are described as follows:

a. Coordination

Descriptive statistics of coordination data of PBV Mutiara men's volleyball athletes are presented in Table 2 below.

Table 2: Descriptive Statistics of Coordination

Statistic	Coordination
N	40
Mean	14,23
Median	14,50
Mode	15,00
Std. Deviation	2,98
Minimum	9,00
Maximum	20,00

Based on the table above, the norms for assessing the coordination of PBV Mutiara volleyball athletes are presented in Table 3 as follows.

Table 3: Coordination Assessment Norms

Interval	Category	F	%
20 <	Excellent	1	2,50
15 – 19	Good	19	47,50
10 – 14	Average	16	40,00
5 – 9	Fair	4	10,00
≤ 4	Poor	0	0,00
Total		40	100%

Based on the table above, it shows that the coordination of PBV Mutiara volleyball athletes is highest in the good category at 47.50% (19 athletes).

b. Arm Power

Descriptive statistics of arm power data of PBV Mutiara men's volleyball athletes are presented in Table 4 below.

Table 4: Descriptive Statistics of Arm Power

Statistik	Arm Power
N	40
Mean	5,62
Median	5,66
Mode	4,21
Std. Deviation	0,92
Minimum	3,98
Maximum	7,89

Based on the table above, the norms for assessing the arm power of PBV Mutiara men's volleyball athletes are presented in Table 5 as follows.

Table 5: Arm Power Assessment Norms

Interval	Category	F	%
7,15 <	Excellent	2	5,00
6,12 – 7,14	Good	11	27,50
5,09 – 6,11	Average	17	42,50
4,06 – 5,08	Fair	9	22,50
≤ 4,05	Poor	1	2,50
Total		40	100%

Based on the table above, it shows that the arm power of PBV Mutiara male volleyball athletes is highest in the average category of 42.50% (17 athletes).

c. Limb Power

Descriptive statistics of limb power data of PBV Mutiara men's volleyball athletes are presented in Table 6 below.

Table 6: Descriptive Statistics of Limb Power

Statistik	Limb Power
N	40
Mean	36,65
Median	35,00
Mode	32,00
Std. Deviation	6,47
Minimum	28,00
Maximum	51,00

Based on the table above, the norms for assessing limb power of PBV Mutiara men's volleyball athletes are presented in Table 7 as follows.

Table 7: Limb Power Assessment Norms

Interval	Category	F	%
45 <	Excellent	7	17,50
39 – 44	Good	3	7,50
33 – 38	Average	22	55,00
26 – 31	Fair	8	20,00
≤ 25	Poor	0	0,00
Total		40	100%

Based on the table above, it shows that the limb power of PBV Mutiara male volleyball athletes is highest in the average category of 55.00% (22 athletes).

d. Agility

Descriptive statistics of agility data of PBV Mutiara men's volleyball athletes are presented in Table 8 below.

Table 8: Descriptive Statistics of Agility

Statistik	Agility
N	40
Mean	36,65
Median	35,00
Mode	32,00
Std. Deviation	6,47
Minimum	28,00
Maximum	51,00

Based on the table above, the norms for assessing the agility of PBV Mutiara men's volleyball athletes are presented in Table 9 as follows.

Table 9: Agility Assessment Norms

Interval	Category	F	%
23,68 <	Excellent	0	0,00
21,79 – 23,67	Good	4	10,00
19,90 – 21,78	Average	12	30,00
18,01 – 19,89	Fair	24	60,00
≤ 18,00	Poor	0	0,00
Jumlah		40	100%

Based on the table above, it shows that the agility of PBV Mutiara male volleyball athletes is highest in the fair category of 60.00% (24 athletes).

e. Speed

Descriptive statistics of agility data of PBV Mutiara men's volleyball athletes are presented in Table 10 below.

Table 10: Descriptive Statistics of Speed

Statistik	Speed
N	40
Mean	10,62
Median	10,56
Mode	10,61
Std. Deviation	0,88
Minimum	8,67
Maximum	12,91

Based on the table above, the speed assessment norms for PBV Mutiara men's volleyball athletes are presented in Table 11 as follows.

Table 11: Handicap Assessment Norms

Interval	Category	F	%
11,15 <	Excellent	11	27,50
10,42 – 11,14	Good	12	30,00
9,69 – 10,41	Average	11	27,50
8,96 – 9,68	Fair	5	12,50
≤ 8,95	Poor	1	2,50
Jumlah		40	100%

Based on the table above, it shows that the speed of PBV Mutiara men's volleyball athletes is highest in the good category of 30.00% (12 athletes).

f. Flexibility

Descriptive statistics of flexibility data of PBV Mutiara men's volleyball athletes are presented in Table 12 below.

Table 12: Descriptive Statistics Flexibility

Statistik	Felxibility
N	40
Mean	32,27
Median	30,80
Mode	29,50
Std. Deviation	3,55
Minimum	27,00
Maximum	39,60

Based on the table above, the norms for assessing the flexibility of PBV Mutiara men's volleyball athletes are presented in Table 13 as follows.

Table 13: Flexibility Rating Norms

Interval	Category	F	%
36 <	Excellent	8	20,00
32 – 35	Good	8	20,00
28 – 31	Average	23	57,50
24 – 27	Fair	1	2,50
≤ 23	Poor	0	0,00
Jumlah		40	100%

Based on the table above, it shows that the flexibility of PBV Mutiara men's volleyball athletes is highest in the avergae category at 57.50% (23 athletes).

g. Arm Muscle Strength

Descriptive statistics of arm muscle strength data of PBV Mutiara men's volleyball athletes are presented in Table 14 below.

Table 14: Deskriptif Statistik Otot Lengan

Statistik	Arm Muscle Strength
N	40
Mean	23,28
Median	23,00
Mode	21,00
Std. Deviation	3,11
Minimum	18,00
Maximum	30,00

Based on the table above, the norms for assessing the arm muscles strength of PBV Mutiara male volleyball athletes are presented in Table 15 as follows.

Table 15: Arm Muscle Strength Assessment Norms

Interval	Category	F	%
26 <	Excellent	10	25,00
23 – 25	Good	11	27,50
20 – 22	Average	14	35,00
17 – 19	Fair	5	12,50
≤ 16	Poor	0	0,00
Total		40	100%

Based on the table above, it shows that the arm muscles of PBV Mutiara male volleyball athletes are highest in the high category at 35.00% (14 athletes).

h. VO_2Max Endurance

Descriptive statistics of VO_2Max endurance data of PBV Mutiara men's volleyball athletes are presented in Table 16 below.

Table 16: Descriptive Statistics of VO_2Max Endurance

Statistik	VO_2Max Endurance
N	40
Mean	33,80
Median	33,60
Mode	33,20
Std. Deviation	3,56
Minimum	26,40
Maximum	41,80

Based on the table above, the assessment norms for VO_2Max endurance of PBV Mutiara men's volleyball athletes are presented in Table 17 as follows.

Table 17: VO_2Max Endurance Assessment Norms

Interval	Catergory	F	%
38,15 <	Excellent	4	10,00
34,52 – 38,14	Good	11	27,50
30,89 – 34,51	Average	17	42,50
27,26 – 30,88	Fair	6	15,00
≤ 27,25	Poor	2	5,00
Jumlah		40	100%

Based on the table above, it shows that the VO2Max endurance of PBV Mutiara male volleyball athletes is highest in the average category at 42.50% (17 athletes).

4. Conclusions

Based on the results of data analysis, description, testing of research results, and discussion on PBV Mutiara men's volleyball athletes, it can be concluded that coordination 46.50% (19 athletes) and agility 60.00% (24 athletes) in the good category. Arm power 42.50% (17 athletes), limb power 55.00% (22 athletes), flexibility 57.50% (athletes), arm muscle strength 27.50% (14 athletes), and VO2Max 42.50% (17 athletes) in the average category. Speed 30.00% (12 athletes) in the fair category.

5. Acknowledgments

Based on the conclusion of the above research, there are remarks that can be conveyed, namely:

a. For coach, can improve training programs to improve coordination, arm power, limb power, agility, speed, flexibility, arm muscle strength, and VO_2Max endurance of volleyball athletes.
b. For athletes to add other exercises that support in improving coordination, arm power, limb power, agility, speed, flexibility, arm muscle strength, and VO_2Max endurance.

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Appendix

Statistics									
		Coordination	Arm Power	Limb Power	Agility	Speed	Flexibility	Arm Muscle Strength	VO_2Max Endurance
N	Valid	40	40	40	40	40	40	40	40
	Missing	0	0	0	0	0	0	0	0
Mean		14,23	5,62	36,65	36,65	10,62	32,27	23,28	33,80
Median		14,50	5,66	35,00	35,00	10,56	30,80	23,00	33,60
Mode		15,00	4,21	32,00	32,00	10,61	29,50	21,00	33,20
Std. Deviation		2,98	0,92	6,47	6,47	0,88	3,55	3,11	3,56
Minimum		9,00	3,98	28,00	28,00	8,67	27,00	18,00	26,40
Maximum		20,00	7,89	51,00	51,00	12,91	39,60	30,00	41,80
Sum		569.00	224,61	1466,00	796,33	424,70	1290,80	931,00	1351,80