



The Contribution of Arm Muscle Strength and Wrist Flexibility to the Accuracy of Doing the Services in Volleyball at SMK Negeri 5 Palembang

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Abstract

The purpose of the study was to whether between the and the atas in lon students at SMK Negeri 5 Palembang. The research method is quantitative. The research population was X class students of SMK Negeri 5 Palembang, namely X.Ans and X.PSPT, *Sampling* technique, the sample of X class was obtained. ANS as many as 20 students. Data collection techniques are tests and documentation. Data analysis techniques are normalistas test, multiple linear correlation and F test. The population in this study were all X ANS and X PSPT classes totaling 40 students. The sampling technique in this study used *purposive sampling* technique, namely class X ANS as many as 20 students of SMK Negeri 5 Palembang. The results of the research on arm muscle strength obtained a value of 892 then the F test was rejected. H_0 rejected H_a accepted because the hypothesis results show $F_{count} > F_{table}$ $33.09 > 3.55$. The magnitude of the contribution of arm muscle strength to the accuracy of the volleyball top serve is 79%. Wrist flexibility obtained a value of 945 then the F test was H_0 rejected H_a accepted because the hypothesis results show $F_{count} > F_{table}$ $8.50 > 3.55$. The amount of contribution of wrist flexibility to the accuracy of the volleyball top serve is 89%. The results showed that there was a significant contribution between arm muscle strength and wrist flexibility to the accuracy of the volleyball top serve of SMK Negeri 5 Palembang which amounted to 0.954 with a significant level of 5% for $N = 20$ with the results of the F test showing the results of $8.606 > 3.55$ which means that the hypothesis was rejected and the results of the F test showed the results of $8.606 > 3.55$ which means that the results of the F test were rejected. H_0 rejected and H_a accepted. While the determinant test shows a contribution of 91%.

Keywords: Arm Muscle Strength, Flexibility, Accuracy of Upper Serve

Abstrak

Tujuan penelitian untuk mengetahui apakah terdapat kontribusi antara kekuatan otot lengan dan kelentukan telapak tangan terhadap ketepatan melakukan servis atas dalam olahraga bola voli pada siswa di SMK Negeri 5 Palembang. Metode penelitian korelasi dengan pendekatan kuantitatif. Populasi penelitian siswa kelas X SMK Negeri 5 Palembang yaitu X.ANS dan X.PSPT, dengan teknik Purposive Sampling maka didapatkan sampel kelas X. ANS sebanyak 20 siswa. Teknik pengumpulan data adalah tes dan dokumentasi. Teknik analisis data adalah uji normalitas, korelasi linier berganda dan uji F. Populasi dalam penelitian ini adalah seluruh kelas X ANS dan X PSPT yang berjumlah 40 siswa. Teknik pengambilan sampel dalam penelitian ini menggunakan teknik purposive sampling yaitu kelas X ANS sebanyak 20 siswa SMK Negeri 5 Palembang. Hasil penelitian kekuatan otot lengan memperoleh nilai 892 kemudian uji F_{H_0} ditolak H_a diterima karena hasil hipotesis menunjukkan $F_{hitung} > F_{tabel}$ $33,09 > 3,55$. Besarnya kontribusi kekuatan otot lengan terhadap ketepatan servis atas bola voli mendapatkan hasil 79%. Kelentukan pergelangan tangan memperoleh nilai 945 kemudian uji F_{H_0} ditolak H_a diterima karena hasil hipotesis menunjukkan $F_{hitung} > F_{tabel}$ $8,50 > 3,55$. Besarnya kontribusi kelentukan pergelangan tangan terhadap ketepatan servis atas bola voli mendapatkan hasil 89%. Hasil penelitian menunjukkan bahwa terdapat kontribusi yang signifikan antara kekuatan otot lengan dan kelentukan pergelangan tangan terhadap ketepatan servis atas bola voli SMK Negeri 5 Palembang yaitu sebesar 0,954 dengan taraf signifikan 5% untuk $N = 20$ dengan hasil uji F menunjukkan hasil $8,606 > 3,55$ yang artinya H_0 ditolak dan H_a diterima. Sedangkan uji determinan menunjukkan kontribusi sebesar 91%.

Keywords: Arm Muscle Strength, Flexibility, Top Serve Accuracy

Introduction

Sport is the movement of the body and a way to strengthen and nourish the body, but also activities that involve the physical and skills of individuals done for entertainment is the definition of sport. Spontaneous activities that are done freely by finding free time to move the body in order to maintain physical and spiritual health so as to make the body lighter and fresher. According to (Kuntjoro, 2020, p. 70) Sports is one of the physical and psychological activities of a person that is useful in maintaining and optimizing the quality of one's health. Sports is also one of the fields that need attention at this time in its development because sports can improve and also make the nation proud in the regional and international regions. Sports are physical exercises to nourish and strengthen the body, such as soccer games, volleyball games, swimming, javelin throwing and so on.

Volleyball game is a sport that competes two teams in the same field, the method is fast and the movement is flexible, requiring cooperation and mutual understanding from the players. The goal of this game is to pass the ball over the net so that it can fall on the floor of the opponent's

field area and to prevent the same effort from the opposing team. According to Anggariawan's opinion (Endrawan, 2022, p. 426) (Endrawan, 2022, p. 426), the purpose of the volleyball game is for recreation, namely to fill spare time or just for fun. Then move on to another goal, which is to improve achievement. Athletes must have excellent physical condition if they want to achieve achievements. Athlete development and sports coaching require a pattern of organizing matches. Volleyball has developed into a very popular sport among the people of Indonesia, because it can be played by all levels of society, as evidenced by the number of volleyball clubs in big cities and even in rural areas, and also many volleyball events such as PORSENI, PORPROV, PROLIGA and PON. Volleyball game in one team consists of 6 players. Each player must have and master physical, tactical, technical, and mental aspects to win a match. According to Mikanda Rahmani (Mulyadi, 2020, p. 20) There are 6 types of basic volleyball techniques, namely serving, passing, smashing, and blocking. The physical condition component is very important to support other components. One of the basic techniques in volleyball is the serve.

According to Poernomo et al. (Sahabuddin, 2020, p. 23) According to Poernomo et al (Sahabuddin, 2020, p. 23), serving has a very important role in a volleyball game because the purpose of serving is to open the game or how to start the game and try to get the team to score points. However, in order for the volleyball serve to run well, these players must be able to combine various components of physical fitness and technical skills. This is because without physical ability it is very difficult to master and develop good serving techniques. Starting from the importance of the *service* function, various serving methods such as *service up and down* were created. One of the most influential serves in volleyball is the top serve. The top serve is one of the first strokes at the start of a volleyball game, and is performed standing behind the end line and between the extension of the side lines. The top serve requires good hitting skills, so that it can be one of the attack methods to get points and of course it can be one of the attacks at the beginning to kill the ball on the opponent's side. Good service implementation must also be supported by the time, intensity and frequency of service training. With this, it is hoped that players can understand how to serve the target correctly and make it difficult for the opponent.

According to Markus (Arwan, 2020, p. 110) if you want to practice well, of course, you need a good training method that is in accordance with the service action. With the right weight and balance, players will be able to serve better. In sports, physical training is needed in order to achieve maximum performance. Physical training for various sports is the main basis that must be completed in addition to increasing technical and tactical training. Volleyball games also require excellent physical condition, in the sense that playing volleyball in addition to good physical techniques, arm muscle strength and wrist flexibility play an important role in the game.

Strength is the ability of muscles to contract in order to generate resistance. According to Harsuki (in Maifa, 2018, p. 128) Muscle strength is a very important component to improve overall physical condition because: 1) strength is a driver of physical activity 2) strength is a very important role in protecting athletes or people from possible injury. Arm muscle strength is closely related and plays an important role in the successful execution of volleyball serves. Muscle strength can be increased to the maximum according to the needs of each sport that requires strength. According to Gazali (in Amrullah, 2022, p. 10), muscle strength has a vital role in a person in using maximum strength to improve overall physical condition. The muscles contained in the human body have their respective functions and work according to their functions. Likewise, the arm muscles that influence and play an important role when serving volleyball. *Flexibility* is the effectiveness of a person in adjusting to all activities with a wide stretch of the body. This will be very easily characterized by the level of flexibility of the joints throughout the body. Based on the results of observations and observations made by researchers that the upper serve is a very important initial technique carried out in order to score points, but 1). many students when performing namely in the out field. 2) The upper performed by students still stiff upper celrvis performed is not good and the resulting optimal 3) Lack of students 4) Lack of flexibility of students can opponent. This is due the which is during the upper. The in the overhead highly on the height and flexibility hands of who is ball. oltolt and the flexibility hand in the especially in the upper back.

above this research to whether between the and the upper in the students at SMK .5 Palembang.

Methods

The type is a quantitative approach. According (Sugiyono, 2021, p. 3) (Sugiyono, 2021, p. 3), is a to relationship and level of

relationship between 2 or .. without any attempt to no manipulation of the ..

The research population at SMK Negeri 5 Palembang was X.ANS consisting of 10 males and 10 females and X.PSPT consisting of 11 males and 9 females. Then the sample was drawn with the technique .. Sampling X.ANS a 20 to be ..

The data collection technique is a test, there are 3 used in this : 1) .., consisting of male push up tesh, with stages: a) Initial : The beginning of the tellungkup body ..tellaapak hands on the floor under the chest , sellanjut hands on the floor under his shoulders, elbows in hold or locked in the .. straightened. The whole body ..straight, the body parts do not ..floorhands and heels, the feet are opened at shoulder level; b) : .., body down until his chest hands and then .. start. The body must be straight while doing *push-ups*.without ; and c) : The score is .. number of *push-ups* performed.

Table 1. *Push-UP* Scoring for Men

Age	17-19	20-29	30-39	40-49	50-59	60-69
Elxcellient	>56	>47	>41	>34	>31	>30
Good	47-56	39 - 47	34 - 41	28 - 34	25 - 31	24 - 30
Simply	35 - 46	30 - 38	25 - 33	21 - 27	18 - 24	17 - 23
Seldang	19 - 34	17 - 29	13 - 24	11 - 20	9 - 17	6 - 16
Less	11 - 18	10 - 16	8 - 12	6 - 10	5 - 8	3 - 5
Less Often	4 - 10	4 - 9	2 - 7	1 - 5	1 - 4	1
Bad	<4	<4	<2	0	0	0

:(Widiastuti, 2015, p. 86)

And Women's *Push-Up* .. with the steps of .. on the floor, .. and shoulders on straight .. knees on the floor support for the body; lower the body until the elbows angle of 90 °; starting straight *push-up* movement is done without rest; do ..you can; record the total number of times you do.

Table 2. *Push-UP* Test for Women

Age	17-19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
Elxcellient	>35	>36	>37	>31	>25	>23
Good	27 - 35	30 - 36	30 - 37	25 - 31	21 - 25	19 - 23
Simply	21 - 26	23 - 29	22 - 29	19 - 24	15 - 20	13 - 18
Seldang	11 - 20	12-22	10 - 21	8 - 18	7 - 14	5 - 12
Less	6 - 10	7 - 11	5 - 9	4 - 7	3 - 6	2 - 4
Less Often	2 - 5	2 - 6	1 - 4	1 - 3	1 - 2	1
Bad	0 - 1	0 - 1	0	0	0	0

Source: (Widiastuti, 2015, p. 86)

2) ..tangan, sdapun how to the initial position: on your .. on the floor .. arms straightened .., : (a) Raise the ...possible, holding the face on the floor. (b) Measure the distance the .. rises from the floor. .. distance is 1/2 inch. (c) .. three times and record the .. distance. (d) Measure the distance from the base of the to the .. finger. (e) Record the .. value of the distance.

Table 3. Wrist Flexibility Assessment

Classification	Male	Female
Selmpurna	>12.50	>11.75
Good	12.50 - 11.50	11.75 - 10.75
Simply	11.49 - 8.25	10.74 - 7.50
Less	8.24 - 6.00	7.49 - 5.50
Bad	<6.0	<5.50

:(Widiastuti, 2015, p. 179)

3) atas .., atas stages are a) hand while ..one hand; b) foot alone ..used to ; c) Float the up until it .., hit the bolla ..hand up toward the d) Next step the back foot back ..straighten direction of the and e) : in the target .., in the .. and out ..the field () is .. a value of 0 and the value is the 5 times the performed.

Table 4. Upper Serve Assessment

Intelrval	Katelgolri
> 25	Good
20-24	Simply
10-19	Less
<10	Less Often

:(Nurhasan, 2000, p. 80)

And data collection with documentation. Data analysis techniques, 1) normality test .. test SPSS application, if the value is $W_{hitung} > 0.05$ then the data is said to be .., and $W_{hitung} < 0.05$ then the data is said to be not ; 2) .. linear formula for :

$$R_{yx_1x_2y} = \sqrt{\frac{r^2x_1y + r^2x_2y - 2rx_1y rx_2y}{1 - r^2x_1x_2}}$$

3) F test, .. to .. strength of the relationship between two or .. The F test formula is :

$$F_h = \frac{R^2 / k}{(1-R^2)(n-k-1)}$$

: R: ganda; K: Number of . and n: Number of sample .

Results and Discussion

A. Muscle Strength (*Push-Up*)

The statistical description of muscle strength obtained the average results of the test (*Push-Up*) which is 16.20 with a minimum value of 10 and a maximum of 23 can be described in the following table.

Table 5. Descriptive Statistic of Muscle Strength (*Push-Up*)

Descriptive Statistics					
	N	Min	Max	Melan	SD
Power	20	10	23	16.20	3.318
Valid N (0)	20				

results of male *Push-Up* 7 (35%) students insufficient *Push-Up* levels and 3 (15%) students levels. , the results of the *Push-Up* 1 (5%) student deficient level and 9 (45%) students level. Students are able to (*Push-Up*) possible.

B. Wrist Flexibility

The statistical description of wrist flexibility obtained an average of 18.60 with a minimum value of 13 and a maximum of 25 can be described in the following table.

Table 6. Descriptive Statistics of Wrist Flexibility

Descriptive Statistics					
	N	Min	Max	Melan	SD
Power	20	13	25	18.60	2.873
Valid N (0)	20				

Power	20	13	25	18.60	2.873
Valid N (0)	20				

... results of hand-arming ...10 (50%) male students ... level. ... results of the handball .10 (50%) level.

C. Volleyball Top Serve

The statistical description of the volleyball upper serve obtained an average of 20.20 with a minimum value of 15 and a maximum of 26 can be described in the following table.

Table 7. Descriptive Statistics of Volleyball Upper Serve

Descriptive Statistics					
	N	Min	Max	Melan	SD
Power	20	15	26	20.20	2.707
Valid N (0)	20				

... results of male .. upper ...4 (20%) students .. insufficient levels, 5 (25%) students sufficient levels and 1 (5%) good levels. results of atas 4 (20%) students less and 6 (30%) students enough.

D. Multiple Correlation

... analysis was used tobetween X1 (*Push-Up*), X2 (Wrist Flexibility) and Y (Volleyball Upper Serve). The data was .. SPSS 26 whose results can be seen in the below.

Table 8. Multiple Correlation Test X1 Against Y

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.892 ^a	.795	.784	1.258	.795	70.010	1	18	.000

a. Predictors: (Constant), PushUp

Based on the *model summary* table above:

a. R = 0.892 means that the correlation coefficient is 0.892 this figure shows that the degree of contribution or the level of closeness between *push-ups* to the accuracy of serving volleyball

shows a very strong level of contribution.

b. Sig F change shows the number 0.00 which means the simultaneous contribution between *push-ups* to the

accuracy of the upper serve because if the sig value. F change <0.05 then correlated. Meanwhile, if the sig value.

F change > 0.05 then it does not contribute.

Table 9: Multiple Correlation Test of X2 Against Y

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.945 ^a	.893	.887	.910	.893	150.011	1	18	.000

a. Predictors: (Constant), Flexibility

Based on the *model summary* table above:

a. R = 0.945 means that the correlation coefficient is 0.945 this figure shows that the degree of contribution or the level of closeness between the determination of the accuracy of serving over volleyball shows a very strong level of contribution.

b. Sig F change shows the number 0.00 which means the simultaneous contribution between flexibility to the accuracy of the upper serve because if the sig value. F change <0.05 then correlated. Meanwhile, if the sig value. F change > 0.05 then it does not contribute.

Table 10: Multiple Correlation Test of X1 and X2 Against Y

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.954 ^a	.910	.900	.856	.910	86.470	2	17	.000

a. Predictors: (Constant), Flexibility, PushUp

Based on the *model summary* table above:

a. R = 0.954 means that the correlation coefficient is 0.954 this figure shows that the degree of contribution or the level of closeness between *push-ups* and wrist flexibility to the accuracy of serving volleyball shows a very strong level of contribution.

wrist flexibility to the accuracy of the upper serve because if the sig value. F change <0.05 then correlated. Meanwhile, if the sig value. F change > 0.05 then it does not contribute.

b. Sig F change shows the number 0.00 which means the simultaneous contribution between *push-ups* and

E. F test

test between the .and the .upper X ANS SMK 5 .can be seen in Table 1. F_{tabel} df = N-2 formula:

Table 11.

$$F = \frac{R^2 / k}{(1-R^2)(n-k-1)}$$

$$F = \frac{0,892^2 / 2}{(1-0,892^2)/(20-2-1)}$$

$$F = \frac{0,795664/2}{0,204336/17}$$

$$F = \frac{0,397832}{0,01201976471} = 33,09$$

The hypothesis results above show $F_{hitung} > F_{tabel}$ namely $33.1 > 3.55$, therefore the Null Hypothesis (H_0) is rejected and the Alternative Hypothesis (H_a) is accepted. This study states that there is a simultaneous significant contribution between *Push-Up* to the accuracy of serving volleyball in class X ANS SMK Negeri 5 Palembang.

$F = \frac{R^2 / k}{(1-R^2)(n-k-1)}$ $F = \frac{0,945^2 / 2}{(1-0,945^2)/(20-2-1)}$ $F = \frac{0,893025/2}{0,106975/17}$ $F = \frac{0,4465125}{0,05253088235} = 8,50$	<p>The hypothesis results above show $F_{hitung} > F_{tabel}$ namely $8.50 > 3.55$, therefore the Null Hypothesis (H_0) is rejected and the Alternative Hypothesis (H_a) is accepted. This study states that there is a significant contribution simultaneously between wrist flexibility and the accuracy of serving volleyball in class X ANS SMK Negeri 5 Palembang.</p>
$F = \frac{R^2 / k}{(1-R^2)(n-k-1)}$ $F = \frac{0,954^2 / 2}{(1-0,954^2)/(20-2-1)}$ $F = \frac{0,910116/2}{0,089884/17}$ $F = \frac{0,455058}{0,00528729} = 8,606$	<p>The hypothesis results above show $F_{hitung} > F_{tabel}$ namely $8.606 > 3.55$, therefore the Null Hypothesis (H_0) is rejected and the Alternative Hypothesis (H_a) is accepted. This study states that there is a simultaneous significant contribution between <i>Push-Up</i> and flexibility to the accuracy of serving volleyball in class X ANS SMK Negeri 5 Palembang.</p>

F. Determinant Test

F test, to find X1 and X2 .Y , The . test . and the upper is 91%, formula of the :

1. X1 to Y, KD = 79%
2. X2 to Y, KD = 89%
3. X1 and X2 on Y, KD = 91%

The results of the multiple to .1) X1 on variable Y, shows F count > F table, namely $33.09 > 3.55$ and determination which gets 79%, 2) X2 on variable Y shows F count > F table, namely $8.50 > 3.55$ and determination which results in 89%; and 3) X1 and X2 .Y X F count > F namely $8.606 > 3.55$andupper lip of the .tested .which results in 91%can be .other .outside the . results of .which is another way to collect field in the collection .

data in the ., pictures, ., and others. So it .be concluded that .and are very common if results of the .ball of SMK 5 . .the results of the .which very good level.

This is .telolri (Widiastuti, 2019, p. 75)(Widiastuti, 2019, p. 75), which that .is the .or .to one maximumresistance or .and Harsuki (Maifa, 2018, p. 128).....very .to physical the physical activity, very in from . Thecarried out by (Amrullah, 2022, p. 10) which in maximum to physical significant . between results of 0.563.

And the results of research by (Widya, 2018, p. 260)(Widya, 2018, p. 260) states that strength is a very important component (if not the most important) to improve overall physical condition first, because strength is the driving force of every physical activity. Second, because strength plays an important role in protecting athletes/people from possible injury. Third, because with strength, athletes will be able to run faster, throw or kick further and more efficiently, hit harder, so puula can help strengthen joint stability. From the research results, the hypothesis H_a is accepted or the hypothesis that states there is a relationship between arm muscle strength and the accuracy of service results f

Furthermore, this is by (Bambang & Agung, 2019, p. 100)(Bambang & Agung, 2019, p. 100), that there is a contribution of arm muscle strength to the service, namely if the arm muscle strength increases by one unit score, the results of free shots will increase, and vice versa if the arm muscle strength decreases by one unit score, the results of free shots will decrease. And there is a contribution of service wrist flexibility, namely if the arm circumference increases by one unit score, the results of free shots will increase, and vice versa if the wrist flexibility decreases by one unit score.

And the telolri (Sahabuddin, 2020, p. 110). yang sangat dalam tujuan adalah untuk or cara dan agar tim dan (Arwan, 2020, p. 110) that if you want to well, of good training model that is actions. The that is carried out by (Endrawan, 2022, p. 430) which namely that to be able to good upper the must be able to ... physical and the skills he has. significant result from the results of the upper which is 0.740.

Summary

what has been described above, it that contribution of arm muscle strength to the accuracy of serving up, the contribution of wrist flexibility to the accuracy of serving up in volleyball, and a significant contribution between arm wrist accuracy of up at SMK 5 . Further recommendations are expected to be able to make scientific ... benefits for future , teachers are expected to be able to . and in that can .. is expected to students in the ..

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