



Contribution of Arm Muscle Power and Body Flexibility Regarding Volleyball Services for Athletes

Achmad Romadhonsyah

Public High School 4 South Sumatra, Indonesia

Article Info

Article history:

Received Mar 11, 2024

Revised Apr 8, 2024

Accepted May 12, 2024

Online First Jun 25, 2024

Keywords:

Arm Muscle Power
Athletes
Body Flexibility
Service
Volleyball

ABSTRACT

Purpose of the study: The purpose of this research was to determine the contribution of arm muscle power and body flexibility to service for volleyball among athletes.

Methodology: The type of this research is correlation. The sample in this study were 16 athletes. The research instrument used was an overhead medicine ball throw test, a sit and reach test and a service test for volleyball. The data analysis technique used is to calculate the value level of the relationship or multiple correlation

Main Findings: Based on the results of data analysis, it is known that (1) There is a contribution of arm muscle power to service for volleyball for athletes of 38.81% with a value of $r_{count} = 0.623 >$ from the value of $r_{table} = 0.497$, (2) There is a contribution of body flexibility to service for Volleyball for athletes is 42.90% with a value of $r_{count} = 0.655 >$ from the value of $r_{table} = 0.497$, (3) There is a contribution of arm muscle power and body flexibility to service for volleyball for athletes of 51.55% with a value of $r_{count} = 0.718 >$ from the value of $r_{table} = 0.497$

Novelty/Originality of this study: The results of this research can provide new, more detailed insight into the importance of developing arm muscle strength and body flexibility in improving service quality, and can be used as a basis for designing more effective and specific training programs for athletes.

This is an open access article under the [CC BY](https://creativecommons.org/licenses/by/4.0/) license



Corresponding Author:

Achmad Romadhonsyah,

Public High School 4 South Sumatra,

Jl. Ki Anwar Mangku, Sentosa, Kec. Seberang Ulu II, Kota Palembang, Sumatera Selatan 30267, Indonesia

Email: romadhonsyah@gmail.com

1. INTRODUCTION

Physical fitness is a condition of the body being able to carry out tasks efficient without fatigue, the body still has good reserve energy to enjoy free time in an emergency [1], [2]. Freshness physicality is a person's total functional capacity to do work certain results with good or satisfactory results and without significant fatigue [3], [4]. Freshness physicality is characterized by all parts of the body being able to function efficiently when the body adapt to the demands of the environment. Sport was developed by our nation not just for achieving physical and spiritual freshness, not just to fulfill the motto the classic that says "Men Sana in Corporesano", in a healthy body there is a strong soul [5], [6]. The sport of our nation lies in understanding Indonesian human development as a whole, humans as a totality, namely promote sports and exercise in society [7], [8].

Sport is a tool to develop and improve physical, spiritual and health freshness in an effort to improve the capability of the nation and the implementation of national unity and integrity [9]. Sport can increase confidence and physical and mental abilities and confident in yourself to take on big tasks and heavy [10]. As for

the efforts that the Government has made in business promoting sports and improving sports achievements, among others by carrying out coaching in schools or in the community for achieve maximum performance.

One of the interesting sports is volleyball. The game of volleyball is a major team ball sport that has been known since the Middle Ages, especially in Italy and Germany [11]. However, at that time it was still known as "fäustball" which was played with rules that were very different from today's volleyball rules, both the game rules and the points system in the volleyball game itself. Then in 1895, a physical education teacher from the city of Holyoko, Massachusetts, United States, named Wiliam G Morgan, tried a game like this, which to this day he is known as the inventor of the modern volleyball game which then developed rapidly in various parts of the world, starting and Latin America, Europe and Asia, which later became a sport that was very popular with various groups of people, both in school, government and private environments [12].

Volleyball is a sport that involves volleying a ball in the air back and forth over the pharynx or net with the intention of dropping the ball in the opponent's field to seek victory in the game. Volleyball is a sport that is quite popular in Indonesia, this game is played by two teams, where each team consists of 6 people on a field measuring 9 square meters between the two teams are separated by a net [13], [14]. The main goal in each team is to hit the ball towards the opponent's field so that the opponent cannot return the ball.

In volleyball there are also various basic techniques including: lower passing, upper passing, upper serve, lower serve, smash and blocks [15]. Starting from the importance of the service position in the game of volleyball, So the researcher chose service techniques to be discussed in this research. Service is a ball hit from the area behind the court line goes beyond the net into the opponent's area [16], [17]. Success in volleyball cannot be separated from the elements physical fitness, namely: explosive power, endurance, muscle strength, power muscle endurance, flexibility, speed, agility, balance and coordination [18]. From Several elements of physical fitness, researchers chose explosive power (power) and flexibility to be discussed in this research because of these two elements [19], [20]. It is really needed in volleyball, especially when serving.

Based on the results of temporary observations that the author made on athletes several who served volleyball were found phenomena include the ability to serve above which is still not good, the service is poor carried out tends to be less focused on the target field plot, this is the case it can be seen from the results of the service made by the athlete, the service ball often gets stuck on the net and sometimes the ball served by the athlete goes out of the court [21], [22]. Where ideally the top serve movement should be able to be done with a little bounce the ball with your left hand then hit it right at the bottom of the ball with right hand and directed at the target square on the opponent's field, however often athletes don't do this well so they can it is said that athletes do not master the top serve technique well. The above shows poor arm muscle strength and body flexibility athletes are still low, their movement coordination is still poor, and arm muscle strength, as well as mastery of top serve techniques that are still lacking maximum. Based on the description of the background of the problem above, the researcher is interested conducted research with the research title "Contribution of Arm Muscle Power And Body Flexibility in Volleyball Service in Athletes".

2. RESEARCH METHOD

2.1 Type of Research

This research was conducted using a correlational method, namely compare the measurement results of two different variables in order to be able to determine the level of relationship between these variables. Correlation techniques are used to find relationships and proves the hypothesis of the relationship between two variables if the data are both variables in the form of intervals or ratios, and data sources from two or more variables is the same.

2.2 Popule and Sample

The population is all research subjects and the population in this study was athletes consisting of 16 person. The sampling technique uses a saturated sampling technique, namely sampling technique when all members of the population are used as samples, so the sample in this study was 16 people.

2.3 Data Collection Technique

The data collection techniques used by researchers are as follows: Observation techniques are used to review the research location to find out problems related to the title of the research to be studied. Literature Literature is used to obtain the concepts and theories needed in this research, namely regarding the contribution of arm muscle power and body flexibility to volleyball service athletes. Tests and Measurements to find out the contribution of arm muscle power and body flexibility to volleyball athletes, an arm muscle power test was carried out by rejecting a medicine ball, a body flexibility test and a volleyball service test.

2.4 Data Analysis Technique

The correlation analysis technique used is calculating correlation from X1 (arm muscle power) and X2 (body flexibility) to Y (upper service volleyball). Meanwhile, it provides an interpretation of the magnitude of the power contribution relationship arm muscles and body flexibility in serving volleyball as following:

Table 1. Interpretation of the magnitude of the power contribution relationship arm muscles and body flexibility in serving volleyball

Interval	Category
Equal to 0.00	Not Calculated
Less than 0.01-0.199	Very low
Between 0.20-0.399	Low
Between 0.40-0.599	Medium
Between 0.60-0.799	Strong
Between 0.80-1,000	Very strong

To see the magnitude of the contribution of arm muscle power and body flexibility regarding volleyball service to athletes by looking at coefficient of determination with the formula: $KD = r^2 \times 100$

3. RESULTS AND DISCUSSION

This research discusses the contribution of arm muscle power and body flexibility to volleyball services in athletes. The variables in this research are arm muscle power which is symbolized by X1 and body flexibility which is symbolized by which aims to measure the arm muscle power components of 16 samples, namely athletes. From the results of taking arm muscle power data, it was found that the highest value was 868 centimeters, the lowest value was 527 centimeters, the average (Mean) was 692 centimeters and the standard deviation was 115.54 centimeters.

Then the arm muscle power data can be seen in the distribution of the data in 5 interval classes with a class interval length of 69. In the first class with an interval class range of 527-595 there is an absolute frequency of 4 people with a relative frequency of 25%, in the second class with an interval class range 596-664 there is an absolute frequency of 4 people with a relative frequency of 25%, in the third class with an interval class range of 665-733 there is an absolute frequency of 1 person with a relative frequency of 6%, in the fourth class with an interval class range of 734-802 there is The absolute frequency is 4 people with a relative frequency of 25%, in the fifth class with a class interval range of 803-871 there is an absolute frequency of 3 people with a relative frequency of 19%. For more details, see the table below:

Table 2. Frequency Distribution of Athletes' Arm Muscle Power

No	Interval	Absolute Frequency	Relative frequency
1.	527 - 595	4	25%
2.	596 - 664	4	25%
3.	665 - 733	1	6%
4.	734 - 802	4	25%
5.	803 - 871	3	19%
	Amount	16	100%

Based on field measurement tests using body flexibility test instruments from 16 athlete samples, the results of body flexibility data collection were obtained with the highest value of 33 cm, the lowest value of 15 cm, an average (Mean) of 25.44 cm and a standard deviation of 5.33.

Then the body flexibility data can be seen in the distribution of the data in 5 interval classes with a class interval length of 4. In the first class with an interval class range of 15-18 there is an absolute frequency of 3 people with a relative frequency of 18.75%, in the second class with an interval class range of 19-22 there is an absolute frequency of 1 person with a relative frequency of 6.25%, in the third class with an interval class range of 23-26 there is an absolute frequency of 2 people with a relative frequency of 12.50%, in the fourth class with an interval class range of 27-30 there is an absolute frequency as many as 9 people with a relative frequency of 56.25%, in the fifth class with a class interval range of 31-34 there is an absolute frequency of 1 person with a relative frequency of 6.25%. For more details, see the table below:

Table 3. Frequency Distribution of Athletes' Body Flexibility

No	Interval	Absolute Frequency	Relative frequency
1.	15-18	3	18,75%
2.	19-22	1	6,25%
3.	23-26	2	12,50%
4.	27-30	9	56,25%
5.	31-34	1	6,25%

From the results of the analysis above, it can be understood that arm muscle strength and body flexibility contribute to the ability to serve volleyball. This occurs when the hand moves very quickly in hitting the ball, and the eyes see the target where the ball will be directed, so that the ball can dart quickly towards the opponent's court over the top of the net. Then aim at the target position on the opponent's field.

There is a relationship between arm muscle power and body flexibility on athletes' volleyball service abilities, as evidenced by the value of $r_{count} = 0.718 > r_{table} = 0.497$ where the significance shows that there is a significant relationship with the strong category and with a contribution of 51.55% and the remainder of 48.45% is estimated to be influenced by arm muscle strength and the level of mastery of volleyball service techniques. From the results of hypothesis testing, it shows that athletes' volleyball service ability is influenced by arm muscle power and body flexibility [23], [24]. Thus, it can be concluded that to improve your service ability in volleyball you must first increase your arm muscle power and body flexibility.

The novelty of this research lies in its specific focus on the influence of arm muscle strength and body flexibility on serve quality in volleyball. This research offers a new perspective by integrating two main physical aspects, namely strength and flexibility, to analyze how the combination of the two can improve the serving performance of volleyball athletes [25], [26]. The implication of this research is to emphasize the importance of developing a balanced exercise program, which not only focuses on increasing arm muscle strength, but also on increasing overall body flexibility [27], [28]. The results of this research can provide guidance for coaches and athletes to design training programs that are more effective in improving service quality, which in turn can improve the overall performance of the team in volleyball matches [29], [30].

However, there are several limitations in this research. One is individual variation in response to strength and flexibility training, which may influence study results. In addition, this study may not have considered other factors that also contribute to serve quality, such as hand-eye coordination, service technique, and athlete's mental state, so the results may not fully reflect the complexity of serve performance in a real competition context.

4. CONCLUSION

The conclusion of this research shows that these two factors, namely arm muscle strength and body flexibility, have a significant contribution to the quality of volleyball athletes' serves. By improving these two physical aspects simultaneously, athletes can achieve more optimal serving performance. This research emphasizes the importance of a comprehensive and balanced training approach, which emphasizes not only strength but also flexibility. It is hoped that the results of this research can be a guide for coaches and athletes in designing more effective training programs, in order to improve service performance and team performance in volleyball competitions. However, it should be remembered that individual variations and other factors not covered in this study can also influence the final results, so a holistic approach tailored to the needs of each athlete is still necessary.

ACKNOWLEDGEMENTS

We would like to express our deepest thanks to all parties who have contributed to this research. Thank you to the athletes who were willing to participate and to the coaches who provided support and valuable insight.

REFERENCES

- [1] Y. P. Ediyanti and B. D. Febrianto, "Learning Guidance to Improve the Achievement Motivation of the O2SN Volleyball Athletes in Majalengka City," *3rd Int. Conf. Learn. Innov. Qual. Educ. (ICLIQE 2019) Learn.*, vol. 397, no. Icliqe 2019, pp. 393–401, 2020, doi: 10.2991/assehr.k.200129.050.
- [2] Z. Yang, "Research on volleyball teaching and training based on the improvement of athletes' physical quality," *Int. J. New Dev. Educ.*, vol. 5, no. 8, pp. 111–114, 2023, doi: 10.25236/IJNDE.2023.050820.
- [3] P. Soltani and A. H. P. Morice, "Augmented reality tools for sports education and training," *Comput. Educ.*, vol. 155, p. 103923, 2023, doi: 10.1515/9783110785234-001.
- [4] T. Moshenska and D. Petrov, "Improving the physical qualities of volleyball players using aerobics at the stage of specialized basic training," *Slobozhanskyi Her. Sci. Sport*, vol. 2020, no. 1, pp. 122–126, 2020, doi: 10.15391/snsv.2020-1.021.
- [5] A. Ismailova, "Education and Development of Physical Qualities of Young," *JournalNX- A Multidiscip. Peer Rev. J.*, vol. 9, no. 1, pp. 162–168, 2023.
- [6] I. Hermawan, A. Ramadhana Sonjaya, and M. Sultan Raswan, "HUBUNGAN ANTARA TINGKAT KEBUGARAN JASMANI DENGAN KONSENTRASI BELAJAR PENDIDIKAN JASMANI SISWA," *Holist. J. Sport Educ.*, vol. 1, no. 2, pp. 52–59, 2022, [Online]. Available: <https://journal.uniga.ac.id/index.php/hjse52>
- [7] B. Indrayana and A. Sadikin, "Penerapan E-Learning Di Era Revolusi Industri 4.0 Untuk Menekan Penyebaran Covid-

- 19,” *Indones. J. Sport Sci. Coach.*, vol. 2, no. 1, pp. 46–55, 2020, doi: 10.22437/ijssc.v2i1.9847.
- [8] I. Estevan, F. Bardid, T. Utesch, C. Menescardi, L. M. Barnett, and I. Castillo, “Examining early adolescents’ motivation for physical education: Associations with actual and perceived motor competence,” *Phys. Educ. Sport Pedagog.*, vol. 26, no. 4, pp. 359–374, 2021.
- [9] J. Li, “Application of Mobile Information System Based on Internet in College Physical Education Classroom Teaching,” *Mob. Inf. Syst.*, pp. 1–10, 2021, doi: 10.1155/2021/1481070.
- [10] M. M. Pellegrini, R. Rialti, G. Marzi, and A. Caputo, “Sport entrepreneurship: A synthesis of existing literature and future perspectives,” *Int. Entrep. Manag. J.*, vol. 16, no. 3, pp. 795–826, 2020, doi: 10.1007/s11365-020-00650-5.
- [11] B. Filiz and F. Konukman, “Teaching Strategies for Physical Education during the COVID-19 Pandemic: Editor: Ferman Konukman,” *J. Phys. Educ. Recreat. Danc.*, vol. 91, no. 9, pp. 48–50, 2020, doi: 10.1080/07303084.2020.1816099.
- [12] I. Aartun, K. Walseth, Ø. F. Standal, and D. Kirk, “Pedagogies of embodiment in physical education—a literature review,” *Sport. Educ. Soc.*, vol. 27, no. 1, pp. 1–13, 2022, doi: 10.1080/13573322.2020.1821182.
- [13] R. Boichuk *et al.*, “Relation of the competitive activity effectiveness of volleyball players (Girls) at the age of 16-18 with the physical development indicators,” *J. Phys. Educ. Sport*, vol. 20, no. 2, pp. 615–622, 2020, doi: 10.7752/jpes.2020.02090.
- [14] *et al.*, “Competence and Professional Skills in Training Future Specialists in the Field of Physical Education and Sports,” *Propósitos y Represent.*, vol. 8, no. SPE2, 2020, doi: 10.20511/pyr2020.v8nspe2.690.
- [15] E. Stojanović *et al.*, “Basketball players possess a higher bone mineral density than matched non-athletes, swimming, soccer, and volleyball athletes: a systematic review and meta-analysis,” *Arch. Osteoporos.*, vol. 15, no. 1, 2020, doi: 10.1007/s11657-020-00803-7.
- [16] G. Cosma, A. Chiracu, R. Stepan, A. Cosma, C. Nanu, and C. Păunescu, “Impact of coping strategies on sport performance,” *J. Phys. Educ. Sport*, vol. 20, no. 3, pp. 1380–1385, 2020, doi: 10.5267/j.dsl.2020.3.003.
- [17] K. M. Moen *et al.*, “Caring teaching and the complexity of building good relationships as pedagogies for social justice in health and physical education,” *Sport. Educ. Soc.*, vol. 25, no. 9, pp. 1015–1028, 2020, doi: 10.1080/13573322.2019.1683535.
- [18] W. O’Brien *et al.*, “Implications for European Physical Education Teacher Education during the COVID-19 pandemic: a cross-institutional SWOT analysis,” *Eur. J. Teach. Educ.*, vol. 43, no. 4, pp. 503–522, 2020, doi: 10.1080/02619768.2020.1823963.
- [19] F. Fischetti, F. Latino, S. Cataldi, and G. Greco, “Gender differences in body image dissatisfaction: The role of physical education and sport,” *J. Hum. Sport Exerc.*, vol. 15, no. 2, pp. 241–250, 2020, doi: 10.14198/jhse.2020.152.01.
- [20] A. Gumantan, R. A. Nugroho, and R. Yuliandra, “Learning During the Covid-19 Pandemic: Analysis of E-Learning on Sports Education Students,” *J. Sport Area*, vol. 6, no. 1, pp. 66–75, 2021, doi: 10.25299/sportarea.2021.vol6(1).5397.
- [21] S. Drikos, K. Barzouka, D. G. Balasas, and K. Sotiropoulos, “Effect of quality of opposition on game performance indicators in elite male volleyball,” *Int. J. Sport. Sci. Coach.*, vol. 17, no. 1, pp. 169–177, 2022, doi: 10.1177/17479541211013701.
- [22] V. Varea, G. González-Calvo, and A. García-Monge, “Exploring the changes of physical education in the age of Covid-19,” *Phys. Educ. Sport Pedagog.*, vol. 27, no. 1, pp. 32–42, 2022, doi: 10.1080/17408989.2020.1861233.
- [23] I. Oliinyk, E. Doroshenko, M. Melnyk, R. Sushko, V. Tyshchenko, and V. Shamardin, “Modern approaches to analysis of technical and tactical actions of skilled volleyball players,” *Phys. Educ. Theory Methodol.*, vol. 21, no. 3, pp. 235–243, 2021, doi: 10.17309/TMFV.2021.3.07.
- [24] G. P. Berriel *et al.*, “Stress and recovery perception, creatine kinase levels, and performance parameters of male volleyball athletes in a preseason for a championship,” *Sport. Med. - Open*, vol. 6, no. 1, 2020, doi: 10.1186/s40798-020-00255-w.
- [25] Z. Chen, L. Wang, and X. Wang, “Progress Planning Method of Strength Quality Training of Volleyball Players Based on Data Mining,” *Math. Probl. Eng.*, vol. 2022, 2022, doi: 10.1155/2022/7130419.
- [26] Z. Zhang and H. Min, “Analysis on the Construction of Personalized Physical Education Teaching System Based on a Cloud Computing Platform,” *Wirel. Commun. Mob. Comput.*, vol. 2020, 2020, doi: 10.1155/2020/8854811.
- [27] D. M. Andrade, G. Fernandes, R. Miranda, D. R. Coimbra, and M. G. B. Filho, “Training Load and Recovery in Volleyball during a Competitive Season,” *J. Strength Cond. Res.*, vol. 35, no. 4, pp. 1082–1088, 2021, doi: 10.1519/JSC.0000000000002837.
- [28] O. Solovey, V. Hunchenko, D. Solovey, and K. Wnorowski, “Influence of static balances level on competitive performance indicators of athletes 17-21 years old in beach volleyball,” *Phys. Educ. students*, vol. 24, no. 6, pp. 332–339, 2020, doi: 10.15561/20755279.2020.0605.
- [29] V. Hunchenko, O. Solovey, D. Solovey, Y. Malojvan, A. Yakovenko, and K. Wnorowski, “The influence of special physical fitness of athletes on the level of technique of playing beach volleyball,” *Phys. Educ. students*, vol. 25, no. 6, pp. 364–373, 2021, doi: 10.15561/20755279.2021.0605.
- [30] D. Bores-García, D. Hortigüela-Alcalá, F. J. Fernandez-Rio, G. González-Calvo, and R. Barba-Martín, “Research on Cooperative Learning in Physical Education: Systematic Review of the Last Five Years,” *Res. Q. Exerc. Sport*, vol. 92, no. 1, pp. 146–155, 2021, doi: 10.1080/02701367.2020.1719276.