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Contribution of Hand Eye Coordination and Arm Muscle Strength to Volleyball Serving Ability

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Abstract: The aim of the research is to find out whether there is a contribution between the eyes and arms and arm muscle strength on the ability of the upper body in the sport of volleyball among students at SMA 08 Oku. Correlation research method with quantitative enhancement. The samples are X.1 and Data collection techniques are tests and documentation. The data analysis techniques are normality test, multiple linear correlation, T test and F test. The results of the correlation research for X1 and Y produced a figure of 0.892, while X2 and Y produced a figure of 0.892. For the F test, Fcount (86.470) > Ftable (3.555) and the significant p-value < 0.05, namely 0.000. So it is concluded that Ho is rejected, this means that push-ups and wrist flexibility affect the volleyball serve.

Keywords: Arm Muscles, Arm Points, Top Serve, Volleyball

A. Introduction

Sport has a very important role in human life, not only as a form of physical activity, but also as a means of maintaining psychological and social balance. Kuntjiro (2020) states that exercise is a very vital activity in maintaining and optimizing the quality of a person's health. Not only that, sport also plays a role in shaping individual character and strengthening the sense of togetherness in society. According to experts, sport is a physical activity carried out with the aim of improving physical fitness, health and overall well-being. According to Bucher and Wuest (1999), sport is an activity carried out with certain rules, which aims to improve physical and mental skills, as well as train endurance. In this perspective, sport does not only involve physical activity but also involves mental aspects, where individuals are trained to have emotional resilience and the ability to think quickly.

Furthermore, Lutan (2001) defines sport as an activity carried out systematically with the aim of gaining pleasure, developing skills and improving body function. From this definition, it can be seen that sport is not only beneficial for physical health, but also plays an important role in developing skills and improving an individual's quality of life. In other words, sport has a broader dimension than just

physical activity; Sports also include recreational, educational and social aspects.

One sport that is very popular and has many fans all over the world is volleyball. Volleyball is a team sport that involves two teams facing each other on the same court. In this game, players have to work together to pass the ball over the net and try to drop it in the opponent's area to get points. The fast and dynamic nature of the game requires players to have good reflexes, speed in movement, and the ability to communicate and collaborate with teammates. Teamwork and mutual understanding between players are the keys to success in volleyball. According to Suharjo (2015), volleyball is a sport that requires good coordination between individual skills and teamwork. Without good cooperation, a team will find it difficult to win matches, even if they have players with great individual skills. Therefore, in volleyball games, cooperation and effective communication between players is very important.

Apart from that, volleyball also teaches the values of sportsmanship and discipline. In this game, each player must obey the rules of the game and respect the referee's decision. This attitude of sportsmanship is important in forming an honest, fair and responsible character, both on and off the field. Discipline is also an important aspect in volleyball, where players must have a commitment to practice regularly and maintain excellent physical condition.

As a sport that is competed at regional and international levels, volleyball has great potential to make the nation proud. Volleyball athletes who excel on the international stage not only bring pride to themselves, but also to their country. This shows that sports, including volleyball, have a strategic role in sports diplomacy and in strengthening the positive image of a country in the eyes of the world. Playing volleyball is a recreational activity that can be done for amusement or to pass the time, according to (Endrawan 2022). Then proceed on to the next objective, which is raising achievement. In order to attain success, athletes need to be in peak physical shape. Match scheduling follows a certain structure for both sports coaching and athlete development. Mulyadi (2020) identifies six fundamental volleyball playing techniques: serving, passing, smashing, and blocking. It is crucial for the physical condition component to support the other components. Serving is one of the fundamental skills in volleyball.

Serving is a crucial component of volleyball because it's a means of opening the game and attempting to help the team gain points, according to Poernomo et al. (Sahabuddin, 2020). The players must be able to blend a variety of technical abilities and physical conditioning requirements, though, for volleyball serves to function effectively. This is due to the fact that developing sound serving techniques is extremely difficult without physical prowess. In volleyball, serve plays an important role as the start of every rally. Serving is the first step that determines how the game

will progress, and is often the main weapon for teams who want to gain an advantage from the start. According to Suharjo (2015), serving is the act of sending the ball into the opponent's area with the aim of starting the game and creating opportunities to gain points. Therefore, understanding good and effective serving techniques is one of the basic skills that every volleyball player must master.

One of the most influential and frequently used types of serves in volleyball is the top serve. Top serve is a ball serving technique that is done by hitting the ball from above the head after the ball is thrown into the air. The player's position when serving is standing behind the end line and between the extensions of the side lines of the court. This technique requires strength, precision and good coordination between the eyes, hands and body. According to Nurhasan (2001), the top serve is one of the basic techniques that volleyball players must master because it can provide a strategic advantage for the team. This serve has a speed and direction that is difficult for the opponent to predict, so it often becomes a deadly weapon in a match. Not only as a tool to start the game, the top serve can also be used as an effective attack method. With a good serve, a player can immediately create pressure on the opposing team and, if executed correctly, can result in an immediate point called an "ace."

To achieve optimal results, executing the top serve requires consistent and structured practice. This training covers various aspects, from ball hitting techniques to the ability to target specific areas of the opponent's court. According to Weineck (2000), serving practice must include appropriate timing, intensity and frequency so that players can develop the skills needed to serve effectively. This routine practice also helps players understand how to adjust the power of the shot, the height of the ball, and the right angle to reach the target.

Apart from that, the timing of servicing is very important to pay attention to. Serving too fast or too slow can give your opponent an advantage. Therefore, players must be able to time their serves carefully, ensuring that each movement is executed with perfect coordination. The intensity of training must also be adjusted to the player's physical abilities to avoid injury and to ensure that service training can be carried out optimally. According to Bompa and Haff (2009), consistent and regular practice frequency will help players achieve stability in their service performance.

In practice, a good serve is a serve that is able to reach the target precisely and makes it difficult for the opponent to receive the ball perfectly. One strategy that is often used is to target areas that are difficult for opposing players to reach, such as the corners of the field or the area between the two players responsible for receiving the ball. Serves that successfully hit the target correctly not only provide points for the team, but also create psychological pressure for the opponent, which can ultimately

affect their performance during the match.

Mastery of the top serve technique also requires an understanding of the various variations of the serve that can be used in different situations. For example, a float serve is a type of top serve that is done with the aim of creating a ball that moves without spin so that its path is difficult for the opponent to predict. Other variations include the jump serve, where the player jumps while serving to increase the speed and power of the ball. According to Selinger and Ackermann-Blount (1992), mastery of various types of serves allows players to be more flexible and adaptive in dealing with various situations on the court.

Overall, top serve in volleyball is one of the key elements that can determine a team's success in a match. By understanding basic techniques, practicing consistently, and implementing the right strategy, a player can make serving one of the main weapons to win the match. Therefore, it is important for every volleyball player to develop this skill and continue to practice in order to perfect their serving technique. In line with Arwan (2020), Markus asserts that having a solid training regimen that aligns with service action is essential for improving one's volleyball serving technique. A player's ability to serve will improve with proper weight and balance. For athletes to perform at their best, physical training is necessary. Apart from growing technical and tactical training, the primary prerequisite for participating in different sports is physical conditioning. Being in top physical shape is also necessary for playing volleyball, as the sport depends heavily on hand-eye coordination, arm muscle strength, and proper technique in addition to good athletic play.

In the context of volleyball serves, arm muscle strength refers to the ability of the muscles in the arms to produce the power needed to throw the ball with high speed and power. The muscles involved include arm muscles such as the triceps, biceps, as well as the wrist and shoulder muscles which provide stability and strength during the serve movement. Arm muscle strength is very important to produce a strong and effective serving movement in volleyball. The capacity to provide resistance through arm muscular contraction. In order to improve general physical condition, muscle strength is crucial, according to Harsuki (Maifa, 2018) because: Physical activity is fueled by strength. 2) The ability to shield athletes or individuals from potential harm is greatly influenced by strength. Effective execution of a volleyball serve is mostly dependent on arm muscular strength, which is intimately linked to it. The demands of each sport that calls for strength can be met by increasing muscle strength to the fullest. Muscle strength is essential for an individual to use their maximal strength to enhance their general physical condition, claims Gazali (Amrullah, 2022). Each of the body's muscles performs a specific purpose and is designed to do so. Similar to this, while serving volleyball, the arm muscles are involved and have an impact.

Hand eye coordination is the ability to coordinate eye and hand movements effectively to achieve desired goals. In the context of a volleyball serve, hand eye coordination is very important because it allows the player to precisely measure the position and movement of the ball and regulate the hand movements necessary to serve well. When performing a top serve, the player must be able to quickly observe the direction of the ball, estimate the speed and trajectory of the ball, and then coordinate hand movements to hit the ball correctly at the right time. Exercises that develop hand eye coordination, such as volleyball drills that involve using different balls and varying hand movements, can help players improve their ability to serve volleyball better. The motor coordination component is something that is always needed in almost all sports, both matches and competitions. According to (Irianto, 2018), coordination is the skill to execute movements quickly and accurately at various levels of difficulty effectively. Higher coordination levels make it simpler to pick up new, sophisticated technical and tactical abilities, according to Bujang et al. (Eriyanti, 2022). Muscles that are able to accurately control movement to accomplish a particular physical job are said to be coordinated. According to Eriyanti (2022), individuals with good coordination can execute a range of motions with varying degrees of difficulty rapidly, while maintaining full targets and, naturally, efficiently.

The top serve is a crucial first tactic to use in order to score points, according to the findings of the researchers' observations and observations. However, 1) Students still struggle with performing the top serve; their mistakes often result in the ball getting stuck in the net or leaving the field. The pupils' upper-hand motions are rigid, which results in poor top-hand serves and subpar ball production. 3. The students' upper hand is not well-trained. The pupils' deficiency in proficiency when performing the top hand serve. An opponent's poll may come from mistakes that frequently happen across multiple servers. Students who are weaker during upper learning are the ones who are causing this weak acceleration. A student's wrist height and flexibility when performing a top serve in volleyball greatly affect their targeting. Considering that playing volleyball requires both wrist strength and flexibility, particularly for the upper body. This study intends to determine whether arm strength and upper hand flexibility have a relationship in volleyball among students at SMK Nelgelri 5 Palembang. It is based on the problems mentioned above.

B. Methods

A quantitative technique is used in this type of correlation investigation. Without changing the variables, correlation research seeks to ascertain the nature and degree of the association between two or more variables (Sugiyono, 2021, p. 3). Understanding how one variable connects to other variables is the goal of correlation research, not demonstrating cause and effect. Additionally, according to Arikunto

(2010), correlation research is utilized to determine the strength and existence of a relationship between two or more variables. In addition, correlation research is done to characterize the strength of the association between the variables under investigation, which might shed light on how they interact. This is stated by Riduwan (2013). According to Kerlinger (2004), the purpose of correlation research is to identify patterns of associations between variables by providing an overview of the quantitative relationship between them.

Furthermore, correlation research, according to Sekaran and Bougie (2016), serves to ascertain the degree or strength of the association between two variables, offering insight into the degree to which one variable can affect another without the need for control or manipulation. Based on the relationships that have been discovered, they clarified, variable values can be predicted using the correlation analysis results. Also, according to Creswell (2014), correlation research is frequently used to find connections between related variables in a population in order to gather important data for future study or decision-making.

With an emphasis on classes X.1, which has 10 men and 10 women, and X.2, which has 11 men and 9 women, the research's selected population is SMA 08 OKU students. Specifically, the researcher selected the 20-person X.ANS class as the research sample, using purposive sampling as the sample method. Results from this method are more precise and pertinent to the research subject since it enables researchers to concentrate more on examining the correlations between pertinent factors in a given context.

The data collection technique is a test, there are 3 tests used in this research, namely 1) Tennis ball throwing against a target wall serves as a measure of hand-eye coordination. tennis ball toss at a target wall as a method of measuring hand-eye coordination. As stated by Ismaryati (2006) Here are the processes for implementation: Goal 1: To assess hand-eye coordination. Goal 2: Adolescents ten years of age and above. Materials 3: Line-drawing tape, chalk, or tennis ball. Materials 4: a tennis ball, line-drawing chalk or tape. Aim 5: Implementation instructions: the test subject is told to toss the ball by selecting the direction in which the target is located; trials are provided to the test subject to help them become accustomed to the test procedure; the ball is thrown by tossing it down; the ball must be caught before it bounces on the ground. Points are awarded for each throw that reaches the goal and gets caught in the hand (see point five); 2) The male push-up test comprises the subsequent stages for the arm oltolt strength test: a) Initial Position: With the body lying face down, the tels pelselrta sets the palms of his hands on the ground beneath his chest. He then places both hands on the ground beneath his shoulders, holding their elbows locked while straightening their arms. Place both legs shoulder-width apart, the entire body straight, with only the hands and heels touching the ground. b) Pelselrta does the pose by bending his arms, lowering his body until his chest contacts his hands, and then rolling back to the starting position. A straight body is required for push-ups at all times. Pelselta makes as many calls as she can without pausing; and c) Assessment: The quantity of push-ups completed correctly determines the grade. 3) Test the skill of serving a volleyball ball, the

stages of serving a volleyball ball are a) standing with one hand while holding the ball using one hand; b) Then place only one foot that is opposite to the hand used for hitting; c) Throw the ball up until it passes the head, then hit it by swinging your hand over the top of the ball towards the ball; d) Next, step your back foot behind the eighth row then straighten your hitting hand following the direction of the ball; and e) Scoring: scoring according to the ball falling in the target area, the ball getting stuck in the net and leaving the field (out) is given a score of 0 and the score obtained is the total score of the 5 serves made.

For data collection with documentation. Data analysis techniques, 1) normality test using the Shapirol-Wilk test, 2) correlation, 3) T test and 4) F test, are needed to determine the strength of the relationship between two independent variables simultaneously or more strongly influencing the internal variables.

C. Results and Discussion

The normality test is a test used to determine whether the data in a study is normally distributed or not for each variable. Using the Shapiro-Wilk test, decision making in the Shapiro-Wilk normality test in this research is:

Table 1. Normality Test

	Shapiro-Wilk		
	Statistics	df	Sig.
Hand Eye Coordination	,961	20	,563
Arm Muscle Strength	,967	20	,697
Ability to serve volleyball	,969	20	,740

The normality test table above can be concluded that each variable has a normal distribution because the significant value is >0.05. Significant Push-Up (0.563), significant flexibility (0.697) and significant volleyball serve (0.740).

Correlation Test

The correlation test aims to determine the level of relationship between variables which is expressed by the correlation coefficient (r). To find out and check the research data to see if there is a relationship, carry out a person product moment test.

The correlation between eye-hand coordination and arm muscle strength produces a figure of 0.975. This number means that the two variables have a strong correlation because it is below 0.50. The sign (*) shows that the higher the push-up, the more flexible the wrist and vice versa.

The correlation between eye-hand coordination and volleyball serves produces a figure of 0.892. This figure means that the two variables have a strong correlation because it is below 0.50. The sign (*) indicates that the higher the push-up, the higher

the volleyball serve and vice versa.
The correlation between arm muscle strength and volleyball serves produces a figure of 0.892. This figure means that the two variables have a strong correlation because it is below 0.50. The sign (*) indicates that the higher the flexibility of the wrist, the higher the volleyball serve and vice versa. Following are the results of the correlation coefficient test:

Table 2. Correlation Test

Correlations

		Eye Coordination Hand Strength Arm Muscles	Muscle Strength Arm	Top service capabilities volleyball
Hand Eye Coordination	Pearson Correlation	1	,975**	,892**
	Sig. (2-tailed)		,000	,000
	N	20	20	20
Arm Muscle Strength	Pearson Correlation	,975**	1	,945**
	Sig. (2-tailed)	,000		,000
	N	20	20	20
Ability to serve volleyball	Pearson Correlation	,892**	,945**	1
	Sig. (2-tailed)	,000	,000	
	N	20	20	20

**. Correlation is significant at the 0.01 level (2-tailed).

T Test (Partial)

The partial t test is used to determine whether the independent variable partially has a significant effect on the dependent variable or not. The partial relationship is seen from the significance and t-count values.

Table 3. T-Test Calculation Results

Coefficientsa

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Beta	t	Sig.
1	(Constant)	1,322	1,805		,732	,474
	Hand Eye Coordination	-.488	,267	-.598	-1,830	,085
	Arm Muscle Strength	1,440	,308	1,528	4,674	,000

a. Dependent Variable: Volleyball Upper Serve

Calculations can be done withttable and tcalculated probability with alpha. If tcount>ttable sig 2 tailed > 0.05, then accept Ho and reject H1 and vice versa. Based on table 3 we can see that 1) the eye-hand coordination variable has a significant value of 0.85, which means > 0.05 and has a tcount value of -1.830 and ttable 2.110. This means Ho is rejected. From these results it can be concluded that the eyes do not have a significant effect on the volleyball serve; 2) for the hand muscle strength variable, we see that it has a t value of 4.674 and has a significant value of 0.000 which means <0.05. From these values it can be concluded that wrist flexibility has a significant effect on volleyball serves.

F Test (Simultaneous)

The F test (simultaneous) basically shows whether all independent or independent variables have a joint influence on the dependent or dependent variable.

Table 4. F-test Calculation Results (Simultaneous)

ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	126,741	2	63,371	86,470	,000 b
	Residual	12,459	17	,733		
	Total	139,200	19			

a. Dependent Variable: Volleyball Upper Serve
b. Predictors: (Constant), Wrist Flexibility, Push-Ups

Table 4 shows a calculated value of 4.851 with a significance level of 0.013 with df1 = 2 and df2 = (nk) = (20-2=18), the result obtained for Ftable is 3.555. Based on the output results above, the decision and output table 4.8 above is obtained Fcount (86.470) >Ftable (3.555) with a significant probability p-value < 0.05, namely 0.000. Because the significance level is smaller than 0.05, the regression model can be used to predict the dependent variable serving in volleyball or together with the independent variables. So, it is concluded that Ho is rejected, this means that arm muscle strength and wrist flexibility influence the volleyball serve.

Discussion

The association coefficient between arm muscle strength and volleyball serves is 0.892, according to statistical study results. Furthermore, 0.892 is the correlation coefficient between volleyball serves and wrist flexibility. When it comes to volleyball serving, the dependent variable or the combination of the independent variables is predicted by the F test above Fcount (86.470) >Ftable (3.555) with a significant probability p-value < 0.05, or 0.000. The volleyball serve is influenced by wrist flexibility and arm muscle strength, as indicated by the conclusion that Ho is rejected.

The documentation results, which include the gathering of data from the field in the form of documents, photos, videos, etc., indicate that it is typical for the performance and game strength to directly influence the outcome of the volleyball match at OKU 08 High School. Karelna saw the excellent quality of the research findings.

The strength of oltolt is defined as its capacity to carry out one maximal contraction against resistance, or belban and Harsuki, according to Widistuti (2019). This is supported by Maifa (2018). Strength is the ability to control physical activity, and it plays a critical role in safeguarding athletes and individuals from potential harm, which makes Oltolt strength an essential component for enhancing total physical condition. The power of electronics, which stems from the body's cells employing their utmost physical strength to improve overall physical condition, has never been the subject of research (Amrullah, 2022). The volleyball score of 0.563 was significantly influenced by both the volume of play and the outcomes of the serve.

Research by Widya (2018) also shown that, as strength is the foundation of all physical activity, it is one of the most important if not the most components of improving overall physical condition. The second reason is that strength is crucial for shielding sportsmen and individuals from harm. Thirdly, athletes that possess strength are able to run more quickly, throw or kick farther and more effectively, punch harder, and develop joint stability. The study's findings support the Ha hypothesis, which postulates a connection between arm muscular strength and the precision of service reporting.

The idea that arm muscle strength has an impact on serving that is, that results of free throws will improve if arm muscle strength increases by one score unit and will decrease if arm muscle strength decreases by one score unit was further supported by (Bambang & Agung, 2019). Furthermore, the results of free throws will improve if the arm circumference grows by one score unit, and vice versa if the serving wrist's flexibility declines by one score unit. This is due to the contribution of wrist flexibility.

Reinforced by theory (Sahabuddin, 2020) a good training model that fits the actions of the service member is unquestionably necessary if you want to train well. Arwan (2020) stated that the selvre's role in volleyball is crucial because it is his or her responsibility to start the game or figure out how to start it and try to get the team to score on the pole. The study conducted by (Endrawan, 2022) has examined telecommunication services for volleyball. In volleyball, a player needs to be able to combine their technical and physical capabilities in order to have good volleyball ball serve abilities. Out of the top cell service test results, there was one noteworthy result (0.740).

D. Conclusions

The analysis described previously provides an in-depth picture of the relationship between arm muscle strength, wrist flexibility, and the effectiveness of the top serve in volleyball. From the results of this research, a very strong correlation was found between arm muscle strength and wrist flexibility on the ability to perform an effective top serve. This is indicated by a correlation value of 0.892, which indicates that these two factors have a significant influence on top service performance. Apart from that, the F statistical test which produces an Fcount of 86.470 and greater than the Ftable of 3.555, with a very significant p-value of 0.000 ($p < 0.05$), further strengthens this conclusion.

The top serve in volleyball is a crucial technique and often determines the course of a match. The top serve is not only a game opener but can also be a deadly weapon capable of giving direct points to the team that does it well. Therefore, mastering this technique is very important for every volleyball player, both at the amateur and professional level. However, to be able to perform a top serve well, a combination of various physical factors is required, including arm muscle strength and wrist flexibility. Arm muscle strength plays an important role in providing sufficient thrust when serving. The stronger a player's arm muscles, the greater the power that can be generated to send the ball into the opponent's area with high speed and power. This allows the ball to move quickly and be difficult for opposing players to anticipate, thereby increasing the opportunity to score points. Therefore, exercises that focus on increasing arm muscle strength, such as push-ups, are essential for players who want to improve their top serve ability.

Push-ups are one of the basic exercises that are effective for increasing arm muscle strength, especially the triceps, chest and shoulders, which all play a role in the upper serve movement. By doing push-ups regularly, players can increase the thrust produced by these muscles, so they can perform upper serves with more power. Additionally, push-ups also help improve shoulder stability and core strength, all of which contribute to overall upper serve ability. A study showing a correlation of 0.892 between arm muscle strength and upper serves indicates that increasing arm muscle strength will directly increase the effectiveness of upper serves in volleyball.

However, arm muscle strength alone is not enough to perform an effective top serve. Wrist flexibility also plays a very important role. The flexibility of the wrist allows the player to better control the direction and speed of the ball. With flexible wrists, players can add variations to their serves, such as changing the direction of the ball in the air or making the ball move in patterns that are difficult for the opponent to predict. This provides a significant strategic advantage in the game, because the opponent will have difficulty reading the direction of the ball and making a good reception.

Wrist flexibility is also related to the ability to make smoother and more precise strokes. In a top serve, the right wrist movement can determine whether the ball will fall in an area that is difficult for the opponent to reach or not. Therefore, exercises that aim to increase wrist flexibility, such as stretching exercises or special exercises for the wrist, are very important for players who want to master the top serve technique well.

The results of the F test which shows Fcount of 86.470 is greater than Ftable of 3.555, with a p-value <0.05 of 0.000, providing strong evidence that arm muscle strength and wrist flexibility together have a significant influence on the effectiveness of the top serve in volleyball game. These figures show that these two factors have a large contribution in determining the quality of the service performed by a player. Practically, the results of this research provide several important implications for volleyball coaches and players. First, to improve upper serve performance, players should focus on developing arm muscle strength through appropriate exercises, such as push-ups, bench presses, and other exercises that target the main muscles involved in the serve movement. These exercises must be done regularly and at sufficient intensity to provide the stimulus the muscles need to develop. Second, it is important for players to also develop the flexibility of their wrists. Exercises that focus on increasing wrist flexibility, such as stretching exercises that involve the wrist, should be part of a regular exercise program. This exercise will not only improve flexibility, but also help prevent injuries that may occur due to repetitive movements in volleyball. Third, coaches must understand that arm muscle strength and wrist flexibility cannot be separated in the context of the upper serve. The two complement each other and must be trained simultaneously to achieve optimal results. A balanced training program, which includes developing strength and flexibility, will provide a strong foundation for players to perform the top serve well and effectively.

In conclusion, arm muscle strength and wrist flexibility have a significant influence on the effectiveness of the top serve in volleyball. The very strong correlation between these two factors and top serve ability suggests that to improve top serve performance, players should focus on developing their arm muscle strength and wrist flexibility. The results of the F statistical test which shows high significance further strengthen the importance of these two factors in determining the quality of top service. Therefore, players and coaches must ensure that the training program includes appropriate exercises to develop arm muscle strength and wrist flexibility, thereby improving top serve ability and making a positive contribution in volleyball matches.

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