e-ISSN 2798-3544

Sinar Sport Journal Vol: 5, No 2, 2025, Page: 1-10

Agility And Some Forms of Flexibility and Their Relationship to the Accuracy of the Smash Hit to Different Areas in Volleyball for Players of Al-Hadara University College Private, Aged 18-22

Abdul-Razzaq Abdullah Ibrahim*

Al-Hadara University Private

*Correspondence: Abdul-Razzaq Abdullah Ibrahim
Email: abdra@alimam.unc.edu.iq

Received: 02-10-2025
Accepted: 18-11-2025
Published: 24-12-2025

Abstract: *This study aims to examine the relationship between selected forms of flexibility and agility with the accuracy of spike execution in volleyball players aged 18–22. The research focuses on identifying which physical components most significantly influence spike accuracy in both straight and diagonal directions. A descriptive correlational research design was employed. The research sample consisted of 25 male volleyball players from Imam University College, selected randomly from the total population after excluding libero and injured players. Data were collected using standardized physical tests, including spinal flexibility tests, shoulder joint range of motion tests, Barrow agility test, and spike accuracy tests targeting specific court areas. Pearson's correlation coefficient was used to analyze the relationship between flexibility, agility, and spike accuracy. The results revealed a significant correlation between spinal extension flexibility and straight spike accuracy, as well as between dynamic spinal rotation and spike accuracy in both straight and diagonal directions. Agility showed a significant relationship with straight spike accuracy but not with diagonal spike accuracy. Conversely, shoulder joint flexibility demonstrated no significant correlation with spike accuracy in either direction. These findings indicate that spinal flexibility and agility play a more critical role than shoulder flexibility in enhancing spike accuracy. The study concludes that volleyball training programs should prioritize dynamic spinal flexibility and agility development to improve offensive performance.*

Keywords: *Flexibility, Agility, Spike Accuracy, Volleyball Performance, Motor Abilities*

Introduction

Measurements and tests fundamentally influence the evaluation process. Coaches use them to determine their players' capabilities in relation to the game's requirements, track their progress, and make comparisons and positive correlations, particularly regarding physical and technical aspects. This highlights areas of strength and weakness, paving the way for reinforcement, adjustments, or remediation of training paths. Any development in the sports field depends on flexibility, a crucial element of physical fitness. Its degree varies from one activity to another. Hara [1] defined it as "the individual's ability to perform movements with significant variations in the range of motion." Therefore, flexibility is essential in volleyball skills, especially the spike, a fundamental skill in volleyball. A team's success depends on players possessing specific qualities, including the ability to deceive and disrupt opponents' movements. This requires high flexibility in certain body parts, such as

the shoulder joint and spine, which is precisely what volleyball players need to execute the spike skill effectively. The smash, on the other hand, is agility, meaning the ability to change direction or body position and shape efficiently. It requires a combination of skills including balance, motor coordination, speed, reaction time, strength, and endurance. All these qualities need to be coordinated and work together. Hence the importance of studying certain forms of flexibility and their relationship to the accuracy of performing the smash, in order to benefit from the results and provide scientific value to all those working in this field, enhancing their scientific and training capabilities and raising the technical level of this activity.

Research Problem

Sports development typically begins at the lower levels and continues to higher levels. This requires continuous practical testing and ongoing training to address the negative aspects that accompany the development process. Volleyball, in particular, requires significant effort to improve and resolve its problems. The researcher, who works in this field, observed a lack of precision in some players' duties and capabilities towards the required goals. This activity demands accuracy in the spike to score a point and requires flexibility in certain body parts, especially the shoulder joint. The researcher also noted that the quality of "agility," which refers to the ability to change direction on the ground or in the air, does not reach the high level required for the skill of spikeing to different areas. This skill requires flexibility, speed, and precision in body movement to perform the necessary actions that contribute to the successful execution of the spike in both directions. Herein lies the problem that requires research and reasoning to select the best methods for guiding the movement performance of the spike skill towards improvement. The researcher also observed that the quality of "agility" does not reach the level required for the skill of spikeing to different areas, as it requires flexibility and speed in body movement to perform the necessary actions. The kinesthetic factors that contribute to the successful execution of the two-way spike

Research Objectives

This research aims to:

1. Identify the most important forms of flexibility and their relationship to the accuracy of the spike among players of the Imam College volleyball teams.
2. Identify the relationship between agility and the accuracy of the spike in volleyball among players of the Imam College private university.

Research Hypotheses

1. The researcher hypothesizes the existence of a statistically significant relationship between certain forms of flexibility and the accuracy of the spike in different areas among players of the Imam College volleyball teams.
2. The researcher hypothesizes the existence of a statistically significant relationship between agility and the accuracy of the spike in different areas among players of the Imam College volleyball teams.

Similar Theoretical Studies

Theoretical Studies

Flexibility

Flexibility plays a crucial role in determining athletic performance in most sports. Wajih Mahjoub and Ahmed Badri defined it as "the high capacity for coordinated movement between the muscles subjected to the applied force and the muscles that are not contracted, with a good return to the body's natural state." Flexibility is the characteristic of movement that is far removed from laxity and rigidity, and of the body remaining still upon completion of the movement or movement [2]. Flexibility has been categorized into several types and classifications:

First: General flexibility, which includes the body's joints.

Second: Specific flexibility, which refers to the specific flexibility of internal joints. Other categories include kinetic flexibility, static flexibility, and muscular-articular flexibility.

Points to Consider When Training Flexibility

1. Physical and mental readiness.
2. Proper warm-up.
3. Introduce flexibility exercises at the beginning of the training session.
4. Gradually progress from easy to difficult exercises.
5. Introduce active flexibility exercises first, then passive flexibility exercises.
6. Ensure the temperature is suitable.
7. Avoid overexertion and be mindful of strength.
8. Do not train flexibility exercises while ill.
9. Do not train flexibility exercises immediately after fatigue.
10. Start with small body parts and then move to larger body parts.

The Spike (Importance and Characteristics)

The spike has evolved significantly as a result of the development of volleyball. Advanced teams have relied on tall players who excel at attacking from various positions to achieve better results. This was confirmed by Saad Hammad, who stated that the height of players with a jump is approximately 3.25 cm, meaning their vertical jump height reaches 110-120 cm. The spike requires a specific type of player with particular characteristics and qualities:

1. A quick start to the attack to deceive the opponent and disrupt their movement.
2. Powerful execution of offensive spikes while remaining attentive to the block.
3. Mastery of the attack according to the changing dynamics of the game.
4. The attacking player must possess a high level of flexibility, tactical efficiency, and intelligence.
5. The ability to quickly anticipate the setter's shots and have the skill to jump, time, and strike in different directions. 2-1-4 Agility:

The concept of agility is one that is often debated and disagreed upon by researchers in the field of sports due to its connection with other physical and skill-based attributes. Johnson and Nelson indicate that agility can be considered a motor ability because it includes components of muscular strength, movement speed, reaction speed, accuracy, control, and coordination. Risan Khuraibat, quoting Hertz, defined it as "a concept that expresses an individual's ability to perform motor acts characterized by coordination and the ability to quickly modify the motor act, or part of it, on the ground or in the air [2].

Methodology

It is well-known that every research project has a specific methodology that the researcher adopts to arrive at scientific facts. Accordingly, the researcher used the descriptive method and the correlational approach, which means "the strength of the relationship between two or more variables, whether this relationship is inverse or direct [3]."

Research Sample:

The process of selecting an appropriate sample is essential to achieving the research objectives, as it is that part of the population that is tested according to scientific rules and methods so that it accurately represents the population. (2) Accordingly, the original research population consisted of (54) players from the youth teams at Imam University College. The sample size was (25) players, randomly selected, representing (35.51%) of the original population, a sufficient percentage to achieve the research objectives. The researcher excluded (libero) players, as they do not participate in the attack, and injured players, totaling (5) players, representing (65.17%).

Tests and Measurements Under Investigation

a. Flexibility Tests

The researcher used several flexibility tests to measure the shoulder joint and spine, as well as the dynamic range of motion of the spine around the main axis, which is essential to the experiment. The researcher also relied on the Barrow agility test and some skill tests for the volleyball spike.

b. Measuring the Range of Motion of the Spine [1]

This is done by having the player stand upright facing the wall, securely fastened at the pelvis with a safety harness. The player then bends the torso backward from a standing position (extends the torso) as far as possible while the head falls backward. The distance from the wall to the bottom of the chin is measured using a measuring tape. The range of motion is indicated by the number of centimeters the player moves away from the wall.

c. Measuring the Dynamic Range of the Spine Around the Vertical Axis [2]

To perform this measurement, a measuring surface consisting of two parallel horizontal lines, each 75 cm long, is attached to or drawn on the wall. These lines are intersected by a vertical line perpendicular to the ground, meeting at a 35 cm diagonal interval. This line extends horizontally along the upper gradual surface of the ground and is specifically for rightward rotation, starting from the right. The graduals are close together, approximately at shoulder level. To measure the

dynamic range of trunk movement to the right, the player stands facing the wall on their left side, with the toes aligned with the line drawn on the ground. Their body is about an arm's length away from the wall, and they begin rotating to the right, maintaining the foot position and keeping their knees straight. They attempt to touch the wall at the furthest point they can reach on the upper gradual. The distance is measured; the greater the distance, the greater the range of trunk movement around the vertical axis to the right [4]. The same procedure is followed for leftward rotation on the lower gradual. 3-2-2 Barrow's Test for Measuring the Ability to Change Direction

Agility Test: Zigzag Run (Barrow Method) 3 x 4.5 m
Objective of the Test: To measure the ability to change direction during a transitional movement.
Equipment: A rectangular running track erected on a hard, rough surface, measuring 5.47 m in length and 3 m in width.
Five posts used in the high jump, corner flags like those used in football, or a chair are selected, noting that the post, flag, or chair must be at least 30 cm long.
The test area is marked according to Figure (1).
The start and finish lines are clearly marked.
Performance Procedure: The subject assumes a ready position from the high start behind the starting line.

Upon receiving the starting signal, the subject performs a zigzag run between the five posts three times consecutively.

The subject begins running from a standing position at the starting line (A). The running direction is determined by the shape indicated in the diagram, which is the number (8) in English. The legs or chairs must not be pulled, dropped, removed, moved from their positions, or collided with; rather, the subject must simply run around them. When the subject completes three circuits, they must continue running until they cross the finish line (B). If the test is not performed correctly, or if an error occurs in the performance conditions, the test is repeated once. The subject is given only one attempt. The test must be explained and a model created before it is administered.

Scoring:

The time taken by the test-taker to complete three turns of the rectangle is recorded to the nearest 1/10 of a second, starting from the moment the start signal is given until crossing the finish line after completing the third turn.

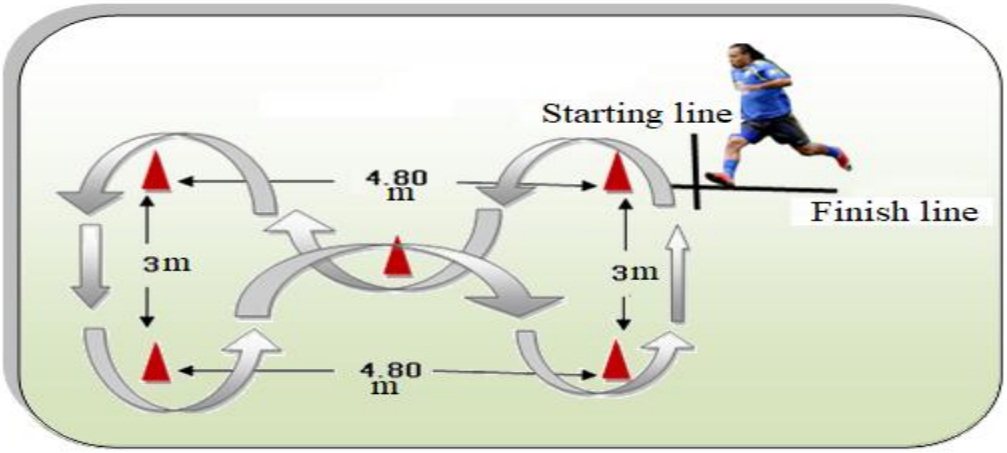

Figure (1) ZigZag run test in the form of (1)

Measuring Shoulder Joint Range of Motion [5]

A wooden stick (120 cm long and 2 cm in diameter) was used. The player stood with the stick in front of their body, gripping it in the middle of their hands. The player then raised their arms forward and backward, attempting to bring the stick behind their back without bending their elbows. The distance between the grips was measured in centimeters. The smaller the distance, the greater the shoulder joint flexibility.

Testing Spike Accuracy in Diagonal and Straight Directions

Purpose of the test: To measure the accuracy of the spike in diagonal and straight directions.

Equipment: Volleyball court, 15 regulation volleyballs, 15 cm wide tape, chalk, two mats. Performance Specifications: The target area is represented by two squares measuring (3x3 m), one in position (5) and the other in position (1) in the back area. The mat is placed in the center of the shaded square. The player performs the smash from position (4) after the ball is set by the setter in position (3). The smash is directed towards the mat, once diagonally and once straight. Scoring:

1. Each player is given 15 attempts diagonally and 15 attempts straight.
2. (4) points are awarded for each successful smash where the ball lands on the mat.
3. (3) points are awarded for each successful smash where the ball lands in the shaded area within the square.
4. (2) points are awarded for each successful smash where the ball lands in areas A and B.
5. The maximum score for this test is (120) points.

(Statistical Analysis)

The researcher used the simple correlation law to determine the relationship between flexibility and accuracy in smash shooting through a number of choices and statistically analyzed them using the following law [6]:

$$\text{Percentage} = \frac{Part}{All} \times 100$$

$$\text{arithmetic mean} = \frac{\sum S}{N}$$

Torsion coefficient= $\frac{\sum(S-O)}{N}$

Wherea : N number of samples , S variables , O arithmetic mean

Selecting (T) for statistical significance of correlation

Simple correlation coefficient (Pearson's)

Result and Discussion

This section includes the presentation, analysis, and discussion of research results in the form of a table showing the interrelationship matrix related to specific flexibility patterns and the smashing skill for the research sample of (70) players [7].

Table (1) shows the results of the correlations between flexibility patterns and smashing skill.

The skill of striking / **The crusher** / **Forms of flexibility**	**Correlation coefficient (T)**	**Straight crushing blow**	**Qatar's crushing blow**
Measurement of spinal kinetic flexion	T	0.312	0.123
		* 2.708	1.022
Measuring the dynamic range of motion of the spine around the vertical axis	T	0.284	0.273
		* 2.700	* 2.340
Measuring the range of motion in the shoulder joint	T	0.094	0.074
		0.779	0.612
fitness	T	*2.233	0.614

After applying Pearson's simple correlation law, the results in Table (1) were analyzed to determine the correlation coefficient between spinal extension and accuracy in the straight smash technique. This coefficient was (0.312). Using the t-test, the researcher obtained a correlation coefficient of (2.708), which is greater than the critical value of (2) and below the significance level of (0.05) with (68) degrees of freedom, indicating statistical significance. The correlation coefficient between spinal extension and accuracy in the diagonal smash technique was (0.123). Using the t-test, the researcher obtained a correlation coefficient of (1.022), which is less than the critical value of (2) and below the significance level of (0.05) with (68) degrees of freedom, indicating statistical significance. The researcher attributes this to a lack of focus on developing players' flexibility through continuous intensive exercises that encompass the required range of motion. This aligns with the assertion by Harrah that flexibility enables individuals to perform various movements. With significant differences in the areas of movement[1].

Table (1) shows the correlation between the dynamic range of movement of the spine around the vertical axis and the accuracy of the smash in the straight and diagonal direction. The correlation values were (0.274, 0.284). When the researcher used the t-test to determine the significance of the correlation, the values were (2.340, 2.700), respectively. These values are greater than the critical value of (2) and below the significance level of (0.05) with (68) degrees of freedom, indicating that the correlation is significant. The researcher believes this correlation is important for players to move to the correct position to ensure their body is in front of the ball and to estimate the accuracy of hitting the ball in the straight and diagonal directions. Flexibility is one of the necessary movement factors for efficient movement, in addition to being a factor of physical fitness. Table (1) also shows the correlation coefficient between the range of movement in the shoulder joint and the accuracy of hitting in both directions, which is (0.094-0.074). The researcher used the t-test to determine the significance of the correlation. (0.779-0.612) respectively, which is lower than the tabulated value of (2) and below the significance level of (0.05), indicating that it is not significant. Ahmed confirms Fait's statement that the specific range of motion of the joint affects movement. Hence, the researcher believes that joint flexibility plays an active role in correct motor performance. Table (1) also shows the correlation value between the ability to change direction and the accuracy of shooting in a straight line, which is (2.233), higher than the tabulated value of (2) and below the significance level of (0.05), indicating that it is significant. Meanwhile, the correlation coefficient between the ability to change direction and the accuracy of shooting a smash in a diagonal direction was (0.614), lower than the tabulated value of (2) and below the significance level of (0.05), indicating that it is not significant, as agility means [2]

Conclusion

Based on the results obtained and the use of statistical methods, the researcher was able to reach the following conclusions:

1. There is a significant correlation between the extension of the spine and the accuracy of the spike shot in the straight line.
2. There is a significant correlation between the dynamic movement of the spine around the principal axis and the accuracy of the spike shot in the straight and diagonal directions.
3. There is a non-significant correlation between the dynamic extension of the spine and the accuracy of the spike shot in the diagonal direction.
4. There is a non-significant correlation between the flexibility of the shoulder joint and the accuracy of the spike shot in the diagonal and straight lines.
5. There is a significant correlation between agility and the accuracy of the spike shot in the straight line with volleyball.

Recommendations

In light of the aforementioned conclusions, the researcher recommends the following:

1. Focus on training players based on the movement path of the player performing the skill and linking it to the various forms of flexibility. 2. Conduct periodic tests and

analyze physical and skill levels based on these tests before starting the training program to identify strengths and weaknesses and develop appropriate solutions.
2. Conduct research on the agility of young volleyball players.
3. Emphasize shoulder joint flexibility in advanced volleyball teams.

References

Asadi, A., Ramirez-Campillo, R., & Arazi, H. (2021). The effects of plyometric training on agility, speed, and explosive power in young athletes. Journal of Sports Sciences, 39(4), 1–10.

Borrione, P., Pigozzi, F., & Giombini, A. (2020). Physical fitness and volleyball performance: A systematic review. Journal of Human Sport and Exercise, 15(2), 1–15.

Chaabene, H., Negra, Y., & Granacher, U. (2021). Change-of-direction speed in team sports. Sports Medicine, 51(2), 1–22.

Clemente, F. M., Ramirez-Campillo, R., & Nakamura, F. Y. (2022). Movement demands and agility in team sports. Biology of Sport, 39(3), 1–9.

Forthomme, B., Croisier, J. L., & Crielaard, J. M. (2020). Shoulder flexibility and injury prevention in overhead sports. Sports Health, 12(5), 1–8.

García-de-Alcaraz, A., & Usero, L. (2020). Performance indicators in elite volleyball. International Journal of Performance Analysis in Sport, 20(4), 1–13.

Hammami, M., Negra, Y., & Shephard, R. J. (2021). Effects of agility training on athletic performance. Journal of Strength and Conditioning Research, 35(8), 1–9.

Hara: Principles of Training, translated by Abdullah Nassif, (1975, p. 206)

Hernández-Davó, J. L., & Sabido, R. (2021). Influence of core strength on spike performance in volleyball. European Journal of Sport Science, 21(6), 1–10.

Horníková, H., & Jeleň, M. (2022). Motor abilities as predictors of volleyball performance. Physical Education and Sport, 20(1), 1–7.

Katic, R., Grgantov, Z., & Jurko, D. (2020). Morphological and motor predictors of volleyball success. Sports, 8(12), 1–11.

Lopez-Fernandez, J., & Sanchez-Sanchez, J. (2023). Agility and movement efficiency in volleyball athletes. Journal of Sports Research, 10(2), 1–9.

Maher Ahmed Al-Issawi, Lecture on Motor Abilities – Their Concept and Components, College of Basic Education, Department of Physical Education

Marques, M. C., & van den Tillaar, R. (2020). Relationship between flexibility and explosive strength. Journal of Sports Medicine and Physical Fitness, 60(3), 1–8.

Marwan Abdul Majeed Ibrahim, Scientific Training and Statistical Methods for Selection and Measurement in Physical Education, 1st ed. (Amman: Dar Al-Fikr for Printing, Publishing and Distribution, 1996), p. 53

Marwan Abdul Majeed Ibrahim: Scientific Training and Statistical Methods for Testing and Measurement in Physical Education, 1st ed. (Amman: Dar Al-Fikr for Printing, Publishing and Distribution, 1996)

Mroczek, D., Januszkiewicz, A., & Kawczynski, A. (2021). Kinematic analysis of volleyball spike accuracy. Sports Biomechanics, 20(5), 1–14.

Muhammad Hassan Alawi and Muhammad Nasr Al-Din Radwan: Motor Performance Tests, Cairo, Dar Al-Fikr Al-Arabi, 2001, pp. 256-258.

Muhammad Subhi Hassanin: Measurement and Evaluation in Physical Education, Vol. 1, 3rd ed. (Cairo: Dar Al-Fikr Al-Arabi, 1995)

Nikolaidis, P. T., & Ingebrigtsen, J. (2020). Physical fitness profiles of competitive volleyball players. International Journal of Sports Physiology and Performance, 15(6), 1–7.

Oliveira, L. P., & Freitas, T. T. (2022). Agility performance and neuromuscular coordination in volleyball. Journal of Sports Science & Medicine, 21(3), 1–8.

Ramirez-Campillo, R., García-Hermoso, A., & Moran, J. (2021). Effects of combined training on volleyball performance. Sports Medicine, 51(1), 1–20.

Sheppard, J. M., & Young, W. B. (2020). Agility literature review: Definitions and testing. Strength and Conditioning Journal, 42(2), 1–12.

Slimani, M., Paravlic, A., & Tod, D. (2022). Physical fitness determinants of volleyball performance. Frontiers in Physiology, 13, 1–11.

Stojanović, E., Ristić, V., & Milanović, Z. (2021). Core stability and spike performance in volleyball. Journal of Sports Sciences, 39(15), 1–9.

Wajih Mahjoub and Ahmed Badri, Principles of Motor Education (University Press for Printing and Publishing, Mosul, 2002), p. 129

Ziv, G., & Lidor, R. (2023). Physical characteristics and training considerations in volleyball. International Journal of Sports Science & Coaching, 18(1), 1–12.