

**Analysis of some kinematic variables of upgrading stage and their relationship to the variable of the maximum height of contact point with the ball during the performance of the smash serve skill in volleyball.
A case study for (POC) Volleyball Team**

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Abstract :

The study aimed to identify the values of some bio-kinematic variables that characterize the upgrading stage of in the performance of the smash serve skill in volleyball, as well as studying the relationship between the height of contact point with the ball and some bio-kinematic variables (the speed and length of the player's jump and the maximum height of the hip joint at the moment of hitting the ball). In this study, we used the descriptive approach for its relevance to the nature of the study. The study sample included 06 players from the Nahdhat Takadoum Chlef POC team for volleyball for the 2016-2017 sports season, each player made 05 attempts where the total attempts were 30, and in order to analyse the bio-kinematic data to find out the correlation relationship between them, the following statistical methods were used (arithmetic mean, standard deviation, Pearson correlation coefficient). The study found a statistically significant correlation between the height of contact point with the ball, the speed and length of the player's jump and the maximum height of the hip joint at the moment of hitting the ball in performing the smash serve skill in volleyball.

Keywords: kinematic variables- Smash serve- Upgrading- Volleyball.

Article info

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1-Introduction and research problem:

Volleyball has made significant strides in recent years due to the study of biomechanical markers linked with high performance, which has profited from the widespread attention paid to sports science in recent decades. Volleyball is considered to be one of the games that requires a high level of technical talent and performance precision. Then, the smash serve is the most important skill and defining characteristic of contemporary international team play. (Nahida Abed Zaid, 2015), "The teams that achieved the first four ranks in the Olympic Games in Atlanta (1996) exclusively used the smash serve by (50%) compared to the Olympic Games in Barcelona (1992), where the percentage of teams using the smash serve was (25%)." (2015). This is corroborated by (Moras, 2008) in his analysis of 377 servings from the teams of the group that plays the qualifiers in Madrid and qualified for the 2004 Olympic Games in Athens. He discovered that the smash serve was utilized 84.9% of the time compared to other serve types. The national championship tracker observes the players' reluctance to employ the smash serve, and when it is used, it frequently results in an error or a point against its owner. To this end, we set out to identify some of the bio-kinematic indicators governing this ability. Most players and coaches do not pay enough attention to the time it takes to push, the efficiency with which they perform, or the length of their jumps during regular training, and the process of pushing only begins once the player has taken the proper position to bend their legs in accordance with their individual physical and technical abilities. According to (Mustafa, 2012), "increasing the time of pushing means increasing the amount of force produced, hence; an increase in the vertical height of the jump," and a good serve requires that the player's height and the moment of meeting the ball coincide. We decided to carry out this research in order to investigate the factors that contribute to this deficiency and to uncover the errors that players make while attempting to perform the smash serve transmission. This was especially important in light of the fact that we are aware that there are six stages that define this ability. In order to have a successful smash serve, the upgrading stage is regarded as being the stage that is the most vital and crucial .Because of this, we are able to shed some light on the study of the relationship between the height of the contact point with the ball and the most essential bio-kinematic factors that characterize this stage.

This led us to ask the following question: Is there a statistically significant relationship between some bio-kinematic variables of the upgrading stage and the height of contact point with the ball in the performance of the smash serve skill in volleyball?

2-Hypothesis:

We hypothesized that there is a statistically significant relationship between the height of contact point with the ball and some bio-kinematic variables (speed, length and player's jump and the maximum height of the hip joint at the moment of hitting the ball) for the upgrading stage in performing the smash serve skill in volleyball.

3-Research objectives:

- To identify the values of some bio-kinematic variables that characterize the upgrading stage in performing the smash serve skill in volleyball.
- Knowing the relationship between the height of contact point with the ball and some bio-kinematic variables for the upgrading stage in performing the smash serve skill in volleyball.

4-Search terms:

4-1- Service in volleyball: The serve is defined as putting the ball into play by the right back row player who is in the serving area and hits the ball with one hand (open or closed) or any part of the arm. (Akram Zaki, 1996, p. 454), and after the player runs for three steps, he jumps and rises to the top and hits the ball without dropping the hitting arm quickly (Thévenot & Jean, 2010, p. 73).

4-2-The smash serve: It is one of the important types of serves, whose performance is divided into six basic stages: the stage of preparation, the stage of throwing the ball upwards, the stage of approaching, the stage of advancement, the stage of hitting the ball, the stage of landing. (Saad Hammad, 2010, p. 97)

4-3-The upgrading stage: It is the fourth stage in which the jump takes place after the two approaching steps and the weight of the player's body is transferred behind the heels to the feet and then the combs. The angle of the thighs, knees, and ankle joint is in certain degrees (Akram Zaki, 1996, p. 141)

4-4-Kinematic variables: They are concerned with the relationship between a specific movement of a body and its time and place without exposure to the forces that cause this movement, in other words, it is the science of an abstract description of the movement without exposure to the forces causing it. (Omar, 2015, p. 154)

5- Previous studies:

- ✓ **Yarob Abdel-Baqi Daykh (2011)** conducted a study entitled Evaluating the values of some kinematic variables in the performance of the crushing serve of young volleyball players, The aim of the research is to evaluate some of the biomechanical variables in

the performance of the crushing serve of the South Gas Club volleyball team. The study sample consisted of (10) players representing some of the excellent clubs participating in the Iraqi league to be compared with the players of the South Gas Club. The researchers used the descriptive approach in a survey method, and the researchers also used the statistical program (Spss) in order to extract the values of the arithmetic means and standard deviations. The results showed that there was a difference in the values of some kinematic variables between the two samples, which indicates a divergence and difference in the performance of some parts of the skill among the South Gas Club players.

- ✓ **Walid Ghanem Thanoun (2008)** carried out an analytical study of some kinematic variables of straight (diagonal) crushing hitting from the back area and their relationship to accuracy in volleyball. Where the study aimed to identify the values of some kinematic variables for the straight (diagonal) crushing hit from the posterior region, As well as identifying the relationship between the values of some kinematic variables for straight (diagonal) crushing multiplication from the back area and accuracy The research sample consisted of (18) players representing the national teams of Nineveh Governorate and Mosul. (8) players were selected from the best of them in the accuracy test for the purpose of analysis. The researcher used the descriptive approach to suit the nature of the research He used statistical treatments (arithmetic mean, standard deviation, t-test and Pearson correlation coefficient), and reached the following results:

There is a significant correlation between the accuracy and the speed of the last step, as well as the presence of a significant correlation between the accuracy and the horizontal distance to get up, the horizontal speed to get up and the distance to get up.

6-Research Procedures

6-1-Research Methodology: The descriptive approach was used, which aims to describe the phenomenon to be studied in an accurate description, expressing it qualitatively or quantitatively.

6-2- The research sample: The research sample consisted of the senior players of the Nahdhat Chlef team, who numbered (06) six players included in the study and who are active in the first class of the Algerian National Championship. Each player made 5 correct attempts that were used in the analysis.

7-Fields of research:

7-1- The human field: the senior players of Nahdhat Chlef POC Volleyball team for the

2016-2017 sports year

7-2-The time frame: The study was conducted on 10/05/2017.

7-3- Spatial domain: The multi-sports hall, the martyr Mohamed Nasser Chlef.

8-Homogeneity and equivalence of the research sample:

Table (1) shows the homogeneity and the equivalence of the research sample:

variables	Arithmetic mean	standard deviation	twisting coefficient
weight	80.83	6.21	0.52
length	187.33	4.55	0.84
age	26.67	7.12	1.15
training age	14.83	5.49	0.51

The sample is homogeneous in weight, height, age and training age because the values of the twisting coefficient were all confined between (± 3)

9-Means of collecting information:

- 1- Arab and foreign sources and references.
 - 2- Tests and measurements.
 - 3- SONY video camera with a frequency of 25 frames per second.
 - 4- LENOVO computer.
 - 5- Measuring tape
 - 6- Electronic scale.
 - 7- Scale 1 meter.
 - 8- A legal volleyball playground.
 - 9- (06) Volley-balls.
 - 10- Kinovea sports movement analysis program 0.8.
- 11-The variables of the kinematic study of the upgrading stage in performing the**

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smash serve skill in volleyball.

- 1- Height of the hip joint point at the moment of hitting the ball: It is the vertical distance limited between the hip joint point and the ground.
- 2- Height of the player's contact with the ball: It is the vertical distance limited between the point of the ball's center of gravity and the ground, and it is measured in metres.
- 3- The player's jump speed: It is the calculation of the jump distance over the time taken, and it is measured in meters per second.
- 4- The length of the player's jump: It is the distance limited between the instep of the rising foot and the heel of the landing leg, and it is measured in metres

10-Description of field procedures:



The main experiment was conducted in the same hall and at the same time at 15 pm in the afternoon on 10/05/2017 and the total number of attempts was (30) attempts by (05) attempts for each player.

The researcher used a Sony video camera (25 images/second) and its height was (1.25) m from the floor's surface and (5.5) m away from the right side of the player, and this allows us to photograph all stages of the technical performance of the skill.

The researcher also used a drawing scale with a length of (01) meter thread between the camera and the player.

11-Statistical means:

The data was processed statistically through the use of the statistical package program (spss) through the use of the following applications:

- The arithmetic mean.

- The standard deviation.
- Pearson correlation coefficient

12-View search results:

12-1-Data description:

Table No. (2) shows the arithmetic averages and standard deviations of the studied bio-kinematic variables.

Bio-kinematic variables	Mean	standard deviation
The maximum height variable of the player's contact point with the ball	3.451	0.117
The height of the hip joint point at the moment of hitting the ball	2.218	0.085
The player's speed jump	1.726	0.361
The player's length jump	1.587	0.265

We note from the table above that the arithmetic mean of the maximum height of the player's contact point with the ball was 2.151, with a standard deviation of 0.117. As for the height of the hip joint point at the moment of hitting the ball, its arithmetic mean was 1.378 with a standard deviation of 0.085; whereas, for the player's jump speed variable, the arithmetic mean was 1.726 and the standard deviation was 0.361, and the player's jump length variable was 1.587 of arithmetic mean and 0.265 of standard deviation

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12-2-Analysis of results:

Table No. (3) shows the correlation between the studied bio-kinematics variables.

Bio-kinematic variables	The maximum height of the player's contact point with the ball	Maximum height of hip joint the moment the ball is hit	Player's speed jump	player's length jump
The maximum height of the player's contact point with the ball	1	0.682**	0.463**	0.447*
Maximum height of hip joint the moment the ball is hit	0.682**	1	0.318	0.148
Player jump speed	0.463**	0.318	1	0.820**
player jump length	0.447*	0.148	0.820**	1

**** The correlation is statistically significant at 0.01**

*** The correlation is statistically significant at 0.05**

13-Interpretation and discussion of the results:

From the above table it appears that the value of the correlation coefficient between the variables of the maximum height of contact point with the ball and the maximum height of the hip joint point at the moment of hitting the ball is (0.682), which is greater than the

tabular and estimated value (0.479) at the degree of freedom (28) and the level of significance (0,01), which indicates the significance of the correlation relationship, and the reason behind this relationship is that the jump movement is an explosive movement that comes through the muscles of the legs that give great strength to the player's body by bending the legs well, and the player gains the amount of movement from the ground by approximate steps, which mainly contribute to the rise of the center of gravity of the body through a good push, and according to Newton's third law (for every action there is a reaction equal in amount and opposite in direction) and this is what we notice in the player's upgrading to its maximum height, helps the player to hit the ball from the top so that he can than hitting and directing the ball better. This is consistent with a study (Yarob Abdel-Baqi, 2011).

The value of the correlation coefficient between the variables of the maximum height of the contact point with the ball and the speed of the jump appeared at (0.463), which is greater than the tabular value estimated by (0.479) at the degree of freedom (28) and the level of significance (0.01), which confirms the correlation between them, and the reason for the existence of This relationship is due to the fact that the smash serve skill needs a high speed before the jump, and this speed is generated from the approximate steps through which the player obtains a large kinetic momentum, because the flight speed depends on the amount of linear momentum that the player possesses during the approaching stage, as “the player's flight speed is the sum of the horizontal and vertical speed of the body during flight.” (Saeb, 1991, p. 43).

From the table, it was also found that the value of the calculated correlation coefficient is (0.447) for the variables of maximum height of the contact point with the ball and the length of the player's dart, which is greater than the tabular that estimated the value of (0.347) at the degree of freedom (28) and the level of significance (0.05), which indicates that there is a significant correlation between these two variables, as Dr. Hussein Mardan Omar sees in his study entitled: a comparative study in the values of some kinematic variables between the performance smash serve in volleyball (diagonally and straight) and their relationship to accuracy (2007). The reason behind this relation is that the jump length variable indicates the depth in bending the legs, where the legs expand to try to reduce the collision with the ground and give a period to shift the force from the horizontal to the vertical direction in the next stage of the movement to increase the stretching of the muscles of the legs, which increases the production of the force applied to the ground; thus, achieving a greater height that helps in directing the ball with higher accuracy to the opponent's area. In order to reach a high level of success in performing the smash serve skill, it is necessary to work on improving the player's upgrading and flight, especially if we know that the height of the net is 2.43 m, which is a great height according to the distance between the serve line and the net of 9 m, and this can only be achieved by improving the values of bio-kinematic

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variables during the upgrading stage such as the speed of the jump, its length, and the height of the hip joint point at the moment of hitting and directing the ball to the opponent's playground.

14-Conclusions and Recommendations:

14-1-The research concluded the following conclusions:

- There is a statistically significant association between the height of the contact point with the ball and the player's jumping speed when performing the volleyball smash serve talent.
- There is a statistically significant relationship between the height of the contact point with the ball and the length of the player's dart when executing the volleyball smash serve technique.
- There is a statistically significant link between the height of the point of contact with the ball and the maximal height of the hip joint at the time the ball is struck when performing the smash serve skill in volleyball.

14-2-Recommendations:

- Adopting the findings of the research for the purpose of developing the skill performance of the players.
- Training the players for the smash serve skill in the best mechanical conditions of speed, times and angles.
- Expanding the scope of the study on other biomechanical variables in performing the smash serve skill in volleyball.

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