The Effect of Physical-Skill Training for the Development of Some Biomechanical Variables for Posture Outputs
The latent and precision of the smashing serving skill of volleyball players

Mona Taha Idris
University of Technology - Department of Student Activities
MUNA.T.IDREES@UOTECHNOLOGY.EDU.IQ

ABSTRACT

The purpose of the research is to identify the proposed exercises using different exercises, and to identify the effect of the proposed exercises to develop some biomechanical variables and their impact on the development of the accuracy of the crushing sending skill in volleyball for the applicants, and the researcher imposed significant statistical differences in some biomechanical variables, and the accuracy of the crushing sending skill, and the researcher used the experimental method on a sample of (24) Players representing the total research community The research was applied to a sample of (15) players from the Army and Police Sports Club, and the pre- and post-tests were conducted, and the researcher concluded the need to pay attention to the skill and physical performance of all skills and pay attention to biomechanical variables to reach the highest levels.

1- Introduction to the research:

1-1   Introduction and the importance of the research:

The science of biomechanics has a great role in reaching the best achievement, and that the game of volleyball is one of the games that requires accuracy and competition in terms of performance stages and its high requirements in terms of physical and skill, and the importance of research came in developing the level of some biomechanical variables for volleyball players, which is reflected in their performance of the skill of crushing transmission, and training them according to its motor path and its correct mechanical conditions so that the player is able to apply the skill and pay attention to accuracy according to the scientific method to reach the highest Levels.

2-1 Research Problem:

The game of volleyball is one of the games whose basic skills have developed, especially some offensive skills, including hitting and crushing serves, because it is the basis for achieving victory, and the skill of crushing serve requires appropriate technical performance and accuracy in performance and all players should master this skill, and coaches must allocate time to train it and emphasize the details of the performance by identifying biomechanical variables, and the study came in order to identify the effect of the proposed training exercises to develop some biomechanical variables, and the accuracy of the skill Overwhelming serve for advanced volleyball players.

1-3   Research Objectives:

1- Identifying the level of some biomechanical variables in advanced volleyball players.
2- To identify the effect of proposed training for the development of some biomechanical variables and the accuracy of the crushing sending skill in advanced volleyball players.

1-4   Research Hypotheses:

- There are statistically significant differences between the pre- and post-tests in the development of some biomechanical variables and the accuracy of the crushing sending skill in advanced volleyball players.

1-5   Research Areas:

1.5.1 Human Field : Army and Police Club players for the 2024-2025 season.

1.5.2 **Temporal Domain** : 10-2-2025 until 28-4-2025.

1.5.3 Spatial Area: Army Sports Club Hall, Police Sports Hall.

2. Research Methodology and Procedures:

2-1 Research Methodology: The researcher used the experimental method for its suitability and the nature of the study.

2- The research population and its sample: The research population was identified with the (24) players who applied from the Army and Police Sports Clubs, and the sample was selected by the deliberate method from the players of the Army and Police Sports Club, with (16) players, (9) players from the Army Club, and (7) players from the Police Sports Club with a percentage of (66.66) % of the research population, and (5) players were selected to conduct the reconnaissance experiment from outside the research sample.

2.3 Tools, Devices and Aids:

- A camera with a frequency of (1200) images/s (1) and a tripod for the camera.

- Lenovo laptop .
- Scale (length1 m) and functional phosphorus markers.
- Japanese-made medical scale (Ketecto).
- Measuring tape (15) m.
- A wooden platform with a height of (1 m) and a width of (1.2) m, and the number of (5) is (5).

- Signs, markers, barriers of different heights and shapes, boxes, seats, rubber ropes, and weights.

2-4 Crash Transmission Skill Accuracy [1] :

The skill test was adopted by giving six attempts, and the tester performs the transmission directing the ball towards the areas (A, B, C, D) from the standing position and facing towards the arena, as shown in Diagram (1).

 Four points are scored inside Zone A, three points for each attempt inside Zone B, two points for each attempt inside Zone C, and one point for each attempt inside Zone D, zero when the ball falls outside these zones
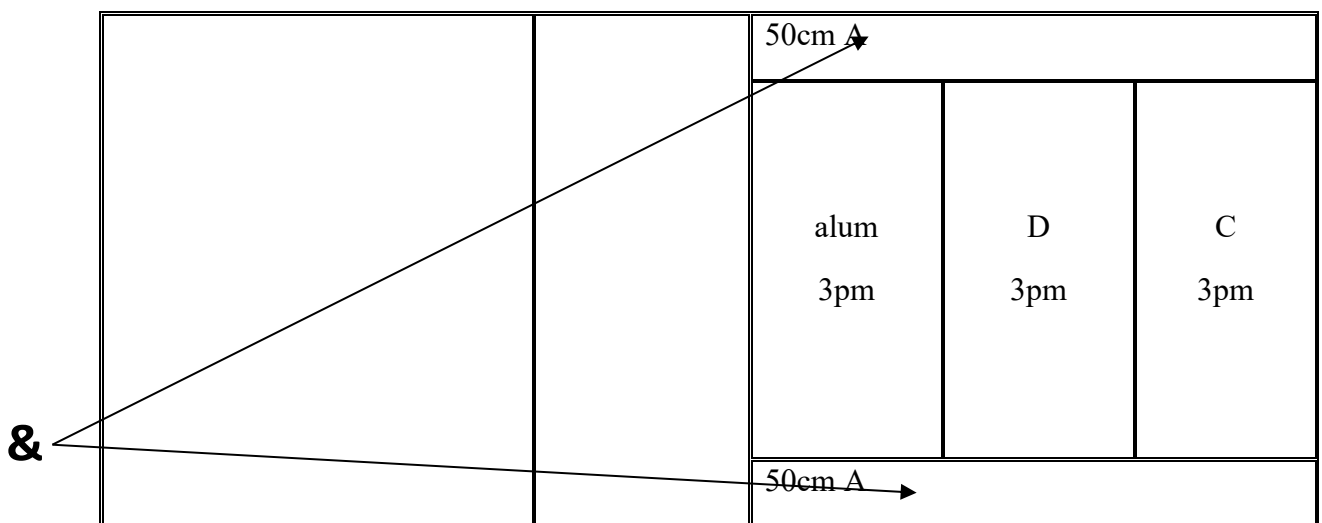
Scheme (1)

Performance Method of Measuring the Accuracy of the Skill of Crushing Transmission

2-5 Exploratory Experiment:

Marwan Abdel Majeed Ibrahim, **The Scientific Encyclopedia of Volleyball,** 1st Edition: (Jordan, Amman, Al-[1] Warraq Publishing and Distribution Foundation, 2001), p. 294.

An experimental study was conducted on a sample of (5) players on Sunday 10/2/2025, as it is considered "practical training for the researcher to identify for himself the negatives and positives that he encounters during the tests to avoid them in the future".(المندلاوي و وآخرونا 1989)

2-5 Field Experiment Procedures:
2.5.1 Tribal Tests:
The pre-tests for the tests were conducted on Sunday 17/2/2025, and the researcher sought to stabilize all the conditions when conducting the post-tests.

2.5.2 Suggested exercises used in the research:
The proposed training curriculum started on Tuesday (19/2/2025), until Tuesday on (30/4/2025), at the rate of (3) training units per week on (Sunday, Tuesday, Thursday), i.e. a total of (30) training units, and this method is applied in the first or second part of the main section and according to the goal of the daily training module, i.e. the training is after the completion of the warm-up or after the completion of the The first part of the main section (Appendix 1) and the work of these exercises continues for a period of time of (60-80) minutes in one training unit and for a period of not less than (10) weeks and (3) times per week, and the load gradient system was used in each week separately, and the intensity ranges from (70-100) % and the contraction time was determined (7-12) seconds or more, and according to the progress of the training, the repetitions were determined (1-5) times or more, and the rest time was determined in relation to the working time, as for determining the intensity by adding the weights to the arms. The intensity of the legs ranges from (2-8) percent, depending on the mass of the arm and the leg during the performance of the exercise.

2-5-3 Computer analysis of results:
2.5.3.1 Analysis of Biomechanical Variables:
- I used the Kinovea software to analyze the mechanical variables of the study.
- Biomechanical variables measured:
  - Knee angle before pushing.
  - Hip angle before pushing.
  - Shoulder angle before pushing.
  - Angle of the attachment before payment.
  - Angular speed of the knee.
  - Angular velocity of the hip.
  - The amount of force.
  - The amount of movement of the torso.
  - The amount of ball for the arm.

2.5.4 Post-tests:
The post-tests were conducted on Tuesday 30-4-2025, in the same sequence as the pre-tests.

2-6 Statistical Methods:

The statistical program (SPSS) was adopted to process the results.

4. Presenting, analyzing and discussing the results:

4-1 Presenting, analyzing and discussing the results of the tests of some pre- and post-biomechanical variables:

Table (1)								
Shows the differences between the pre- and post-tests in the research sample								
Significance of the differences	**T Value Calculated**	**A.F.**	**Q F**	**Standard deviation**	**Arithmetic mean**	**audition**	**Unit of Measurement**	**Biomechanical variables**
Moral	5.97	1.1725	7	0.01	120	southern	degree	Knee angle before pushing
				0.12	127	Go away		
Moral	2.85	28.07	20	0.34	110	southern	degree	Hip angle before pushing
				0.71	130	Go away		
Moral	4.90	1.63	2	1.98	28	southern	degree	Shoulder Angle Before Pushing
				1.02	30	Go away		
Moral	3.74	5.35	5	3.54	150	southern	degree	Attachment angle before payment
				3.01	155	Go away		
Moral	3.98	0.78	0.78	0.95	1.98	southern	M/s	Angular speed of the knee
				1.42	2.76	Go away		
Moral	4.75	0.84	1	0.89	5	southern	M/s	Angular speed of the hip
				1.80	6	Go away		
Moral	5.01	1700.39	2129.742	0.78	2300.6	southern	Newton	Amount of force
				1.01	4301.4	Go away		

Moral	4.75	872.99	1036.681	0.67	4430.342	southern	Kgm/s	Amount of movement of the torso
				0.91	5467.023	Go away		
Moral	6.02	72.49	109.1	1.01	189.3	southern	Kgm/s	Amount of movement of the arm
				0.34	298.4	Go away		
Note/Tabular T value at degree of freedom (15) and probability of error (0.01) = (2.92)								

Table (1) shows that the results appeared significant due to the use of metered exercises and the gradual in the training load, as the player's approach during the approximate steps up to the position of maximum flexion in the knee and is considered a latent position with the presence of the arms behind the body and to make the most of the latent position in the transfer of the amount of movement and the player in the latent position reduced the amount of kinetic energy resulting from approaching, and mastering this position appropriately causes a great benefit from converting the potential energy into kinetic energy, and when it is The speed is good, the player will achieve a better amount of movement, and Hussain Mardan points out, "The difference in kinetic energy is according to the difference in the mass of the moving object and its speed during the performance (1-11), if the mass is constant, then the speed is the decisive factor.

Taking the tight arch in the latent position during flight, maintaining the transmission of energy and the amount of movement, and taking advantage of the appropriate positions for performance, thus achieving a good angular speed for the hip, and the output of the amount of motion for the torso is important because moving the torso quickly means that the player maintains what he has gained of kinetic transmission of strength and speed, as the acceleration of the body is directly proportional to the force exerted and the movement occurs towards the force (11:2). The torso is the largest mass in the body and it is a source of power, and Wajih Mahjoub points out that the torso represents half of the body with its muscles and large mass, so the force generated by it is great when using the kinetic transmission correctly and with great fluidity (12:3) and that this force transmits a lot of the amount of movement to the ball at the greatest speed, and that the player's achievement of the amount of movement for the torso is due to speed, as the shepherd is a decisive factor, where the end of the skill is to hit the ball and move it at a high speed, and that the movement of the arm backwards While swinging backwards and taking the tight arc and the latent position through which the player maintains the kinetic energy of the torso and the restoration of the kinetic energy again is the end of the latent position and the arms take a large share because the torso moves in the direction of the movement of the arms, as the increase in the peripheral speed is through increasing the radius (12:4).

4-2 **Presenting, analyzing and discussing the results of the accuracy of the crushing transmission skill of the pre- and post-tests of the experimental group under research:**

Table (2)

The values of the arithmetic medians, standard deviations, the difference between the arithmetic media, the standard deviations, the calculated value of (T) and the level of significance of the research sample in the pre- and post-tests to test the accuracy of the crushing transmission skill

Significant differences appeared in the accuracy of the performance of the crushing submission

Significance of the differences	t	A.F.	Q F	Standard deviation	Arithmetic mean	Testing	Unit of Measurement	Overwhelming Transmission Skill
Moral	7.02	**0.52**	**3.65**	2.21	19.56	southern	degree	Accuracy
				1.75	23.21	Go away		
The tabular value of t is at (15) degrees of freedom and probability of error (0.01) = (2.92)								

skill, and we note that there is a development in the performance of the players, and this indicates the exercises used according to the biomechanical variables as a result of their regularity in training and their implementation of exercises according to the biomechanical variables, which affected the achievement of the required accuracy, as (Wajih Mahjoub) confirmed that reaching the motor accuracy in sports must have kinetic power (34:5). Developing the values and angles of the knee, hip and shoulder and angular speed of the knee and hip in the players, which contributed to generating additional strength for the working muscles, and accelerating the movement of the striking arm, which allows the player to hit the ball with a full extension of the arm and from the appropriate angle to launch the ball, control the direction of its hit, and produce force at the right moment and speed.

4. Conclusions and recommendations

1- The proposed training has a positive effect on some biokinetic variables in advanced volleyball players.

2- The proposed exercises have improved the accuracy of the crushing submission skill.

Second: Recommendations:

1- The use of various exercises to develop some physical, motor and biomechanical variables because of its positive effect on volleyball players.

2- Providing sports tools and devices used in training in sports clubs to serve the training process for volleyball players.

Sources:

1- Hussein Mardan and Iyad Abdel Rahman, **Biomechanics in Sports Movements**, 2nd Edition, 2018.

2- Samir Muslat Al-Hashemi, **Mathematical Biomechanics** : (University of Mosul, Dar Al-Kutub for Printing and Publishing, 3rd Edition), 2010.

3- Wajih Mahjoub, *Theories of Learning and Motor Development* , Amman, Dar Wael Printing and Publishing, 2001 .

4- Raysan Khraibet Majeed and Najah Mehdi Shalash, **Kinetic Analysis** , International Scientific House for Publishing and Distribution, 2002.

5- Wajih Mahjoub, **Learning and Scheduling of Sport Training** : (Amman, Dar Wael Printing and Publishing), 2001.

Appendix (1)

Total Time	Rest times between repetitions	Exercise Time	Comfort between groups	Totals	Rest between repetitions	Iteration	Workout time	Hardship	Exercise Objective	Exercise
492 S 8.12 D	168 S	84 S	2 D	2	1: 3	3	14 S	95 %	Strengthening the muscles of the shoulder and arm and developing the skill and technique aspect	Perform the skill of crushing transmission from the center of (1) with the addition of a heavy arm (5) percent of the mass of the arm (5) times during (14) seconds.
656 S 10.56 KD	288 S	128 S	2 D	2	1: 3	4	16 S	90 %	Skill and technique development	Performing the skill of crushing (7) strokes from the left side of the transmission line during (16) seconds.
564 S 9.24 KD	216 S	108 seconds	2 D	2	1: 3	3	18 S	95 %	Skill and technique development	Performing the skill of crushing the serve with the addition of a weight to the man with a force of 8% of the man's mass and scoring on a box placed in the field and repeating (5) attempts during (18) seconds.
708 S 11.44 KD	324 S	144 S	2 D	2	1: 3	4	18 S	90 %	Skill Accuracy Development	Placing boxes inside the attacking area, the player performs the skill of crushing the serve with the addition of weight to the arm with a force of 5% of the arm's mass while directing the ball inside the box, and performing the skill (7) times continuously with a time of (18) seconds.

552 S 9.12 D	216 S	96 S	2 D	2	1: 3	4	12th	95%	Development of biomechanical variables of the arms	From the standing position with the arms extended in front of the body, and hold the ends of the rubber with the hands so that the palms of the hands are down, then extend the arms backwards, and perform the exercise (10) times in (12) seconds.
660 S 11 JD	300 S	120 S	2 D	2	1:3	6	10 S	85%	Development of biomechanical variables of the arms	From a standing position, hold the ends of the rubber with your hands, and the arms are extended forward so that the palms of the hands are down, then extend the arms downwards with one leg bent forward and the other back, and repeat (10) times during (10) seconds.
648 S 10.48 KD	288 S	120 S	2 D	2	1:3	5	12 S	90%	Development of biomechanical variables of the legs	From a standing position and the distance between the feet hip-width jump over a box with a height of 50 cm and descend at maximum speed, put weights in the legs with a force of 6% of the weight of the leg, and perform the exercise (10) times in (12) seconds.
690 S 11.30 KD	450 seconds	180 BD	2 D	2	1:3	6	15	90%	Development of biomechanical variables of the arms	Sitting on a reclining chair with both the back and shoulders firmly adjacent to the seat, holding two dumbbells, arms down, then

										bending the arms so that the palms of the hands face the shoulder, the weight of the weight is 50% of the individual's ability, i.e. (5) kg, and performs (10) times in (15) seconds.
60.59 KD										Total