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Study the relationship and attribution of some biomechanical javelin throw variables as an indicator to determine the efficiency of the run variables in achievement of the effectiveness of the javelin throw

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Abstract
The research aims to identify the values of the biomechanical throwing step variables (speed of launch, angle of departure, angle of direction, attack angle, height, spear starting point, forearm angle, upper arm angle, trunk angle , front knee angle , body mass center transmission speed) At the moment of throwing step , and on the relationship and the percentage of its contribution to achievement , where I embodied the problem of searching for the extent to which the largest mass was invested in the player 's body to obtain the value of the momentary power, the descriptive approach was used to study relationships, and the research sample included 8 young players , and it was extracted Evaluate search variables by photographing with cameras CASIO)(120 to 1000 images / second speed and using kinematic analysis software) (Kinovea8.25The fourth chapter includes presenting, analyzing and discussing the data results and extracting the correlation value and the contribution rate to find out which variables are more consistent with the achievement, and the conclusions and values contributed to the achievement of the values of the biomechanical firing step variables (speed of launch, starting angle, angle of direction, angle of attack, height, starting point of the spear. Forearm angle, humerus angle, trunk angle, anterior knee angle , velocity of body mass center transmission) at the moment of throwing step , and either recommendations are to conduct similar research and studies on other variables, use motor analysis periodically during the identification The mechanical changes that the throwing stage takes place.
Keywords: *biomechanical variables, throwing step, launch variables, javelin throw*

Introduction

The rapid development of sports events, especially athletics events, is the result of investing in the latest technology and laboratory research tools and harnessing them to serve sports achievement. The javelin throwing activity is one of the games activities that require high-level technical performance that the athlete possesses interconnectedness with His physical capabilities, as well as mastery of the technical aspects and mechanical conditions that characterize this activity. The variables of the biomechanical throwing step for the parts of the body represented by the man, the aiming arm and the tool, which are important as an indicator to determine the efficiency of these variables at a technical and mechanical level, to achieve the achievement in the effectiveness of the javelin , with the aim of obtaining the performance integrity and the movement of movement that is represented by the linear and circular bar during this step , which It gives it the qualitative value in the method of proper motor performance, so it is our duty as researchers to search for the causes of movement and its parts that give momentum to progress and mathematical achievement, through the interpretation of mathematical skills and the study of the mechanics of movement , and the

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statement of strengths to claim them and find ways to address the weaknesses . The study of the sections of movement is an important aspect in the interpretation of the cases that coincide the athlete during the performance in order to know the specificity of each stage to improve the level of performance, and its close association with (mcg) and the device that is related to the physical laws of the parts of the body, which is usually related to the kinetic transport between the limbs. Lower and upper, in order to overcome the Earth's gravity to ensure that the shooter obtains a high dynamic balance and a streamlined path to the center of gravity of the body and the tool According to the dynamic goal of the performance, which is the achievement. Hence the idea of the two researchers to study the relationship and the percentage of the contribution of some biomechanical throwing step variables as an indicator to determine the efficiency of the starting variables in the achievement of the effectiveness of the javelin throw in the youth group in the Iraqi Games Federation tests for the 2018-2019 season, to improve the level of kinetic performance of the javelin throwing effectiveness and reach the higher levels similar to other countries the world. The researchers noted that the correlation of the absolute and relative angles of some parts of the body, the center of body mass, and the device by overcoming the gravity of the earth, especially in the throwing stage (the throwing step) through the position and velocity of the body mass (mkg) in the final throwing step. There is a correlation between force and speed with proper motor performance, which is related to the full extension of the archer's arm in the preparatory position and the final position of the throw, which coincides with the complete kinematic transmission of the mass of the trunk, which is the largest in the human body and which contributes to the movement of the kinematic of other parts of the body at the moment of the throw and the tool and the extent of exploitation Optimal to obtain the most appropriate movement paths and angles and to achieve the desired goal of performance, which is to obtain the farthest possible distance after throwing , and from here the ***research problem*** *is determined in answering the questions posed by the researchers:*

- What are the values (speed and angle of departure, angle of direction, angle of attack, height, starting point of the spear, forearm angle, upper arm angle, torso angle, front knee angle, and center of body mass transmission speed).
- What is the relationship between values (cruising speed, launch angle, direction angle, angle of attack, the starting point of the spear height, angle, helped angle humerus, torso angle, angle of the front knee, the transmission speed of the center of mass Table cm) achievement.

What is the ratio of the contribution of the values (velocity of departure, angle of departure, angle of direction, angle of attack, elevation, spear starting point, forearm angle, upper arm angle, torso angle , front knee angle , center of mass moving velocity) at the moment of the throwing moment of achievement.

Where the aim of the research is to all of the following:

- To identify the values (speed and angle of departure, direction angle, angle of attack, the starting spear point rise, helped angle, angle of the upper arm, torso angle, angle of the front knee, the transmission speed of the body center of mass) at the moment of the shooting step.
- To identify the relationship between values (speed and angle of departure, direction angle, angle of attack, elevation starting point spear, angle helped, angle humerus, angle trunk, angle of the knee front, the transmission speed of the body center of mass) at a step the moment the shooting, accomplishment
- To identify the ratio of the input values (speed and angle of departure, angle of direction, angle of attack, height, starting point of the spear, forearm angle, upper arm angle, torso angle , front knee angle , body mass center velocity) at the moment of throwing step, by achievement .

Methodology

Use the researchers approach the descriptive style study of relationships Relational to suitability of the research problem, and included research sample (8) players effective throwing spear youth belonging to the clubs Iraq category have been identified research community through the Union tests of Iraqi games for the season 2018-2019, which accounted for (80%) of the research population of (10) players between, and Table No. (1) Shows descriptive statistics for the research sample.

	Mean	**Median**	**Std. Deviation**	**Std. Error of Mean**	**Skewers**	**Coefficient of variation**
Length	1.78	1.79	0.073	0.026	-0.887	0.04
Age of training	7.03	7.30	0.818	0.289	-0.959	0.12
Weight	76.63	78.50	10.756	3.803	-0.570	0.14

Trunk length	0.55	0.56	0.033	0.012	-0.334	0.06
Humerus length	0.30	0.30	0.009	0.003	0.488	0.03
Forearm length	0.26	0.27	0.009	0.003	-0.615	0.03
Thigh length	0.48	0.48	0.024	0.008	-1.255	0.05
Stalk length	0.42	0.43	0.018	0.006	0.070	0.04
Achievement	53.63	54.61	5.559	1.965	-0.646	0.10

Table No. (1) shows that the values of the torsion coefficient were confined to (± 2), especially the researchers' use of the coefficient of variation in order to identify the factor of the intruder on the research variables, if any, since the more the results of the coefficient of variation were 30% or less, the good indicators For sample homogeneity (Wadih, 1999) ***Defining search variables*:** The two researchers, after reviewing the sources specialized in the effectiveness of throwing throw and other sources and research in biomechanics and kinematic analysis, reached a determination of the biomechanical variables that meet the requirements of the research objectives and are as follows:

❖ **The starting angle :**is the path of the center point of the spear mass before leaving a hand until the moment after its launch with the line passing from the center of the spear mass parallel to the ground before leaving the archer's hand

❖ **Attack angle :**is the longitudinal line of the spear before leaving the thrower with the horizontal line passing from the center of the spear block at the same moment .

❖ **Direction angle :**is the product of the direction angle subtracted from the angle of origin.

❖ **Final javelin velocity :**is a result of dividing the instantaneous cruising distance of four consecutive images immediately after the spear leaves the hand.

❖ **Angle of the humerus, aiming arm :**it is the angle measured between the x-axis (horizontal) passing from the shoulder joint with the longitudinal axis of the humerus at the (throwing step) at the moment of launching the spear.

❖ **The angle of the forearm of the aiming arm :**It is the angle measured between the x (horizontal) axis passing from the elbow joint with the longitudinal axis of the forearm bone of the aiming arm at the (throwing step) at the moment of launching the spear.

❖ **Angle absolute trunk :**the measured angle between the vertical plane of the axis of the trunk aimed at (step throwing) for the moment the launch of the spear.

❖ **Corner of the knee to the front leg :**It represents the angle between the linear imaginary passing legs and hip who meet the knee joint moment put the shooting with the yolk .

❖ **The velocity of the center of gravity of the body mass, the gravity of the throw :**measured by dividing the distance covered by m cc from the moment of fulcrum to the moment of launching the spear, and it is divided by the time of this distance.

After that, the two researchers conducted the experiment Exploratory On Sunday 6/9/2019 at the time 5 and half of the afternoon and a sample of (and Athban), in order to identify the camera location, identify the time for needed to prepare all variables of hopper testers, and identify the site cameras (cameras)

Where the Javelin Test was performed (Bastwissi, 1997) The main experiment was on Saturday 6/11/2019 at 5:30 pm, on the stadium of the College of Physical Education and Science and Sports at the University of Baghdad , on a B-sample consisting of (8) javelin players , and each of the following included identifying the physical indicators where It was collected physical measurements of variables for members of the sample of (the height , the length of the trunk , the length of the man , arm length, weight), was set up machine photography first camera and track aiming for a moment the last step , the second camera and point the moment of the shooting in the last quarter of the area of the shooting , one of Type (Ex-Zr200 Casio-Speed 120-1000 image / s), a two - dimensional 2D.For the purpose of visualizing the movement of the shooter's performance with (with the throwing step), which is located from the right and left at a distance (7.20 M), and by height (1.25M) imaging focus lens p n the level of the surface of the ground , to ensure the appearance of all the variables of the study and for the purpose of extracting the values of variables search through the use of a program (KINOVEA0.8,25), When the researchers used the program (SPSS(For data processors to find the descriptive statistics represented by the values of the arithmetic mean, standard deviations, standard error, skew coefficient and

Table No. (2) Shows that descriptive statistics for biometrical variables

Variables	**Mean**	**Median**	**Std. Deviation**	**Std. Error of Mean**	**Skewness**

Cruising speed	23.05	23.31	1.407	0.497	-0.385
Starting angular	38.88	38.00	2.748	0.972	1.824
Angle of direction	6.13	6.00	1.126	0.398	0.488
Angle of attack	45.00	44.00	2.330	0.824	1.626
The height is the starting point of the spear	2.02	2.03	0.251	0.089	0.837
Forearm angle	113.25	115.00	4.367	1.544	-0.664
Humeral angle	70.00	71.00	5.806	2.053	-0.128
The angle of the trunk	16.13	16.00	1.126	0.398	0.488
Anterior knee angle	154.88	156.00	7.643	2.702	-0.731
The speed of moving the center of mass of the body	2.80	2.59	0.519	0.183	1.261
Achievement	53.63	54.61	5.559	1.965	-0.646

Table No. (2) shows the values of the coefficient of skewness between (-0.128 1.824 /) Which is confined between (± 2) and within the distribution curve of natural and this confirms the possibility of statistical analysis of the normal curve , which achieves the first objective of the research , was to extract the values of correlation relationships between the variables of the study through the Pearson Act , which achieves the second goal of the research, then The two researchers worked on achieving the third objective of the research, which is to identify the percentage of contribution of the research variables to achievement, the error rate and the variance value of the variables by the throwing step, which achieves the essential goal of the research. Table (3) shows that.

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**	**F**	**Sig.**
Cruising speed	0.748	0.560	0.487	3.983	7.634	0.033
Starting angular	0.744	0.553	0.478	4.015	7.420	0.034
Angle of direction	0.539	0.291	0.173	5.056	2.461	0.168
Angle of attack	0.616	0.380	0.277	4.727	3.678	0.104
The height is the starting point of the spear	0.580	0.337	0.226	4.891	3.043	0.132
Forearm angle	0.847	0.717	0.670	3.195	15.184	0.008
Humeral angle	0.755	0.570	0.498	3.939	7.940	0.030
The angle of the trunk	0.785	0.616	0.552	3.720	9.631	0.021
Anterior knee angle	0.049	0.002	-0.164	5.997	0.014	0.909
The speed of moving the center of mass of the body	0.722	0.522	0.442	4.153	6.543	0.043

*** When a significant error rate ≤ (0.05) .**

The researchers explain the following results: The two researchers worked on arranging the biomechanical firing step variables according to their importance to enhance the interpretation of these results as shown in Table (4)

Model	**R**	**R Square**	**Std. Error of the Estimate**	**Sig.**	**Sorted by**
Forearm angle	0.847	0.717	3.195	0.008	1
The angle of the trunk	0.785	0.616	3.720	0.021	2
Humeral angle	0.755	0.570	3.939	0.030	3
Cruising speed	0.748	0.560	3.983	0.033	4
Starting angular	0.744	0.553	4.015	0.034	5
The speed of moving the center of mass of the body	0.722	0.522	4.153	0.043	6
Angle of attack	0.616	0.380	4.727	0.104	7
The height is the starting point of the spear	0.580	0.337	4.891	0.132	8

Angle of direction	0.539	0.291	5.056	0.168	9
Anterior knee angle	0.049	0.002	5.997	0.909	10

We note from Table No. (4) that the values of correlation ratios of contribution to the mechanical starting variables to achievement were proportional according to their physical, motor and mental capabilities, as the value of a level of significance for the starting variables ranged between (0.008 - 0.033) less than the level of sig (0.050) It is a significant function , as the partial contribution percentage values for the dependent mechanical starting variables which can be explained by each independent variable have reached a value of (71%) for the launch speed and (62%) for the starting angle, (57%) for the angle of direction, (56%) For the angle of attack , (55%) the height of the starting point of the spear, where the researchers explain this significance to the harmony of the positive relationship between the starting angles in particular and the anthrometer measurements in general, as it is mentioned that the angle, the starting speed and the height of the tool launch there are different directions about its ideal value through which it can be achieved The goal or objectives of the activity as it relates to the anthromometric measurements between the body parts that represent the body's ability to process positivity in the throwing step, especially the height of the starting point of the tool resulting in a high skill performance of interconnectedness, accuracy, speed, angle and speed of launch (Qasim, 2000) . As for the biomechanical variables associated with some absolute angles of the parts of the body, the researchers explain the significance of the value of the level of significance of the variable, the absolute crank angle (0.043) less than the level of sig (0.050) The values of the partial contribution percentage to the dependent variables, which can be interpreted through each independent variable, have reached a value of (52%), which is significant and significant , as the researchers explain this to the positive relationship in which the mechanical starting variables can be inferred above through the close association with the principle of angular momentum transmission The mobility of the working joint in a coordinated and smooth manner to achieve the desired goal by achieving the angles of departure and direction. As for the angles of the upper arm, trunk and knee of the anterior support leg, the value of the significance level (0.909) was greater than the level of sig. (0.050) It is not a significant function , as the partial contribution percentage values, which can be explained by each independent variable, have reached a value of (2%) for the angle of the upper arm and (34%) for the angle of the torso, (29%) for the angle of the anterior anchor knee, where the researchers explain despite not The significance of these angles, but they contributed a small part to explaining the variation of the independent variable, which is the achievement, due to its connection with the muscle moment of these parts, which is related to the type of kinematic performance of the part according to its angular change from the preparatory position to the shooting position that achieves the speed to affect the performance.

As Karl Haybes mentions, as the movement of the aiming arm of the spear tool often begins synchronizing from the moment of thrust when it is pulled forward in order to achieve correct angles in the parts of the body around its axis of rotation (joints) in order to achieve the best kinematic harmony to serve the final path of the spear, which is usually the result of The correct and effective instantaneous force matching and fusion to obtain this high kinetic harmony (Karl, 1985) As for the velocity of moving the center of mass of mass (kJ) in the throwing step, the value of the significance level (0.104 - 0.132 - 0.168) was greater than the level ofsig (0.050) It is not a significant function , as the values of the partial contribution percentage, which can be explained by each independent variable, reached a value of (2%), where the researchers explain the insignificance of the correlation, despite the meager contribution rate, to a weakness in the perception of a motor sensory site. During the transition and coherent and coordinated performance due to a weakness in measuring the angle of the legs as mentioned above, especially the location of the support part, whether in preparation or throwing, it represents the largest mass in the body, which is the trunk from which the speed can be inferred from the force exerted in the amount of movement (force (mass) × Speed (distance / time)), as opposed to skill performance at the moment of throwing, which is related to the performance of the mechanical variables launch. Recalling, (Wajih, 2001) “The movement of the javelin is a mechanical transmission of force from the trunk to the arm and then to the spear. Thus, we obtain the largest force as a result of our use of the movement of the trunk in the throw, and the force generated by the trunk is very large if the kinetic transmission is used in a manner. Correct and great flow.

Conclusions

1. The angle of the crank and the height of the starting point of the spear are the most important components in determining the angle of departure variables.
2. The effect of achievement level by variables starting and absolute angles of integration of performance in the upper limbs of the body and the aiming arm of the instrument.
3. It is not possible to rely on the measurement of the knee angle of the chock leg on its own, so it is best to take the angle of the two legs between the front and back of the material to correlate with the height of the body mass center (mkg) from the ground and overcome the gravity of the earth in moving from preparation to throw.

4. Dependence on the force exerted in performance more than the kinematic transmission index of the body parts represented by the trunk and the arm aiming the tool.
5. Emphasis on studying the variables of each stage of the throwing effectiveness of the javelin at a limit to identify the parts of the stage in order to improve or improve the level of skill performance related to speed and accuracy of performance (mechanical launch variables.(
6. Trainers should do exercises with mixed strength - perception in linking the two phases of preparation and throwing in the throwing step in order to develop a kinesthetic perception of the parts of the body, the exerted force and the tool.
7. Emphasis on intensifying training by matching the angles of the positions of the parts of the body during the throwing stage and (the moment of launch) according to the physical measurements of the players for their importance in achieving momentum and proper movement and obtaining the ideal performance angles.

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