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Strength Training and its Effect in Some Biochemical Variables in the High Jumping of Advanced Players

Dr. Intisar Rashid Hameed*, Dr. Ali Sadiq Dhiab and
Dr. Sarmad Saeed

Abstract--- *The study of biomechanical indicators in the arc of the run and the upgrading stage is one of the important variables that affect the nature of the upgrading and thus affect the result of the race due to the importance of these stages and the consequent variables during the last steps. That's why, the jump-trainings based on assistant means or body weight positively affect the step-time for each of the three steps in the acceleration arc. As well as, it focuses on the momentary strength of each step at this stage. It also significantly affects the speed of motor performance to suit the activity in which the runner needs to perform perfect steps with high flow in order to convert the horizontal speed to a vertical one. This is achieved through producing high instantaneous power and in a short time to achieve a perfect elevation. Those trainings must be built according to real indicators based on scientific results to know the nature of these time-characteristics and the range of its impact on the variables of the last three steps and upgrading, because these variables depend on performance and accuracy and need to stability in performance during attempts. Therefore, some biomechanical variables are found for the three steps and the stage of upgrading through the use of video graphing, kinetic analysis, and preparing special trainings to develop these variables in order to solve this problem that faces the players of the country right now. The research was applied on a group of high-jump players from the country for the (6) advanced-level players and the results of the preceding and following tests were compared. The researchers concluded that the exercises which were performed by using the means and equipment according to the performance and which were used within the strength-exercises are effective in developing the pushing-time at the moments of contact for the last three steps and the stage of upgrading. In the same way, they are effective in the right-time strength of the performance-nature which helped in the frugality of time, the force spent correctly, and the interconnection of the parts of the correct performance of these variables in the last three steps. This is reflected on the stage of upgrading and led to its development.*

Keywords--- *Biomechanics, High Jump and Strength Training.*

I. INTRODUCTION

The interest in other sports sciences and their interplay with the science of training is one of the important aspects in the training process. It succeeds when emphasizing the development of physical abilities according to the development of correlated mechanical variables of the stages of technical performance, especially in high jumping. In this activity, the speed a runner acquires and the style of the performance of the approximate run, especially the

Dr. Intisar Rashid Hameed, Asst. Prof., College of Physical Education and Sport Sciences, University of Baghdad, Iraq.*
E-mail: nuhad_71@yahoo.com
Dr. Ali Sadiq Dhiab, Asst. Prof., College of Physical Education and Sport Sciences, University of Baghdad, Iraq.
Dr. Sarmad Saeed, Asst. Prof., College of Physical Education and Sport Sciences, University of Baghdad, Iraq

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last three steps affect the stage of upgrading, which is the most important stage that determines the level of height achieved by the jumper.

From this, we note that the sport of the high levels in high jump requires using accurate and modern exercises, methods, means of training, and dynamic analysis devices in order to improve recognising the areas of weakness in the players and. This develops special physical abilities through the development of special stages of high jump emphasizing the mechanical variables for the precise stages of technical performance in high jumping which is represented by the momentary force and the push time for the last three steps in high jump and the upgrading stage. Knowing the ranges of such variables makes it easy to prepare physical trainings necessary to avoid errors and defects in dynamic performance and then to improve the training process and make high achievement. Special force exercises depending on the type of activity have a significant impact in the development of performance-force and in high jump, explosive force at the moment of upgrading and relation to the last three steps, and upgrading and the resulting performance during the stage of beam-cross.

The vertical-jump exercises greatly affect the level of biomechanical variables and thus the level of achievement as the variables of time and angles of the body conditions at the moment of upgrading play a vital role in the level of achievement.[1] Therefore, the sport of the high levels in high jump requires using the latest methods and scientific devices in order to guide the training process. From here, the importance of the argument for this study is demonstrated to detect weaknesses and identify the places of imbalance by studying some important mechanical aspects and analysing them during the stage of approach in the arc. Those are aspects as the time of pushing, the momentary strength of each of the three steps and the stage of upgrading, the angle of the knee, the angle of the hip, and the line reached from the area of the hip head and the feet of upgrading. Hence, kinetic analysis is one of the main pillars of evaluating the level of performance and giving the opportunity for the trainers to discover points of weaknesses and strengths and working to overcome them in order that the training process turns in a better scientific reality. That is why, kinetic analysis is considered one of the most honest scales in the correction and guidance. [2]

From this, we see the importance of this study, which is the use of special strength exercises and their impact on the level of performance of the last three steps mechanically and the upgrading-stage and thus mechanically developing the level of performance for the high roller. Despite this, the Iraqi level is still far from the world level, especially in high jump. In fact, there are mechanical variables that must be emphasized during the modern training process for high jump in order to link the effect of the momentary power of the last three steps and its effect on the upgrading-stage, as well as the times and angles of the stage of upgrading-stage and the consequent change in speed and consequently, achievement. The force-trainings directly affect the biomechanical variables of the last three steps as well as the upgrading-moment since the main goal of the approximate run is to obtain the horizontal speed that suits the nature of the performance. [3]

The researchers noted through their field interviews to the reality of racing in Iraq that the performance of most of our sportsmen in Iraq for high jump lacks some mechanical variables in the stage of rough run, especially the last three steps as well as the upgrading-stage. Due to the high technical requirements of this activity, the researchers conduct this study based on the dynamic analysis of the most important variables of the last three steps and the

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upgrading-stage. This is for the purpose of preparing the necessary trainings to develop it and the consequent impact on the times, angles and instant power of these stages.

The new methods of technique came as a result of studies conducted to follow the method by which he can raise the center of the body's weight taking into account the nature of the joints of the body and the muscular action of each joint. That is why, the technical skills related to the stages of high-jump requires the player to perform them smoothly for both the approximate run and the upgrading with compatibility and harmony. i.e.[4] It refers to the accuracy of performance in the waking movements in order to reduce the loss of kinetic energy that is consumed to raise the player's body high during the jumping movement.[5]

The jumper must get the speed suitable for the performance. The speed which required for high-speed jumpers differs from the speed of other activities since the acquisition of the appropriate speed for this activity ensures the correct upgrading process to pass the desired height for the purpose of converting the horizontal speed gained from the approximate run to a vertical one at the moment of upgrading and in the desired direction. the player acquires speed at the end of the approximate run where it reaches more than (8) m/s in the advanced-players. [6] The use of accurate angles for each stage affects the time of performance. So, the training of the variables of the last three steps before the upgrading clearly affects the time of the upgrading and the nature of the angles of this stage. [7]

The Research Procedures

The researchers used the experimental method since it suits the nature of the research problem. the sample of the research includes Elite players of high-jump in the country which are (4) players out of (5) players stand for (80%) of the community of origin selected in the intentional way.

The High Jumping Test with Two Cameras

The variables of the last three steps (pushing time, the instant power for each of the three steps, knee angle, hip angle, line of head and buttocks and feet of upgrading at its moment) are being measured with cameras (2 items). The player passes the height as in international law.

His movement is filmed with a camera situated at (6 m) away from the beam from the front of the jumping direction so that the camera lens is placed vertically on the last three steps and the upgrading-stage in the arc of jogging and height (1) m. This camera follows the movement of the player for five steps in the arc of jogging, the upgrading-stage, jumping, and landing as these points are determined by a reconnaissance experience. Each player's data is recorded as in international high-jump law.

Research Variables

1. Three-steps time through analysis and video imaging by using Kinovea programme.
2. Angle of knee and hip in the upgrading-stage through kinetic analysis.
3. The instant force of the three steps F=MA.

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II. MAIN EXPERIENCE

Preceding Tests and Video Imaging

Preceding tests were conducted at 6:00 p.m. in 15 / 11 / 2018 on Monday. Video cameras (2) were placed and the arc of the run was filmed during the last three steps and upgrading-stage at a distance (6 m) to the opposite side of the jogging arc, vertically and with high (1 m).

Practicing Exercises

Strength trainings for performance were designed according to the biomechanical indicators of the technical performance of the high-jump activity of the research sample. The practicing began on Tuesday (16 / 11 / 2018) and until Thursday (14/1/2019) by three training units per week. The time for each unit is (15 -18) minutes. The sum would be (12) training units using repetitive training in the main section of the training unit. The most of the changes resulting from training usually occur within (6-8) weeks in which sets of strength exercises for performance and speed of performance were selected during certain stages of jumping in the curriculum designed to suit the category and the physical abilities of the players. These exercises are the exercises of explosive force and strength characterized by speed using added weights or rubber ropes and barriers in both feet or by exchanging. This must be done focusing on the performance of the last three steps quickly and distract the strength that suits each step as well as the stage of upgrading and the right angles.[8]

The modern training is a stressful process for an athlete and requires the performance of skill or some exercises multiple times. This can lead to boredom so he emphasizes the variation. That requires the creative trainer to vary the exercises by memorizing the type of skill. i.e.[9] adopting movements similar to performance in exercises in a variable way that allows the player to perform it during the training unit and repeat it successively during the daily training units. This is in order to maintain the desire of the athletes to train and then the dimensional tests were conducted then the tests were conducted in the same sequence as before, on Saturday in (15 / 1 / 2019) and the statistical bag SPSS was used.

III. RESULTS

The results of the last three steps of the jogging arc were presented and discussed.

Table 1: Shows the Computational Circles and the Standard Deviations of Starting- Variables

Variables	Preceding Test		Following Test	
	Mean	SD	Mean	SD
Force of Step 1/N	2442.366	73.5025	2561.599	96.8597
Force of Step 2/N	2601.599	48.4694	2710.346	76.3690
Force of Step 3/N	3630.346	221.2917	3821.502	101.5825
Time of Step 1/Sec	0.12320	0.000583	0.12180	0.000583
Time of Step 2/Sec	0.12100	0.000316	0.12000	0.000000
Time of Step 3/Sec	0.11760	0.000510	0.11500	0.000447
Angle of Knee/deg.	173.00	0.707	173.40	1.140
Angle of Trunk/deg.	161.20	4.817	171.20	4.087

With freedom degree 6-1=5 and Sig 0.05

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Table 2: Shows the difference in the Computational circles and the Value of (SD) and (t) the Moral and Real Calculation and Indication of the Start Variables

Variables	Mean	SD	Accounted (t)	Error-Level	Sig-Level
Force of Step 1/N	119.2328	31.6883	3.763	0.020	Incorporeal
Force of Step 2/N	108.7468	18.9487	5.879	0.004	Incorporeal
Force of Step 3/N	191.1564	57.5291	3.323	0.029	Incorporeal
Time of Step 1/Sec	0.001400	0.000245	5.715	0.005	Incorporeal
Time of Step 2/Sec	0.001000	0.000316	3.162	0.034	Incorporeal
Time of Step 3/Sec	0.002600	0.000245	10.614	0.000	Incorporeal
Angle of Knee/deg.	3.400	0.678	5.013	0.007	Incorporeal
Angle of Trunk/deg.	10.000	3.317	3.015	0.039	Incorporeal

IV. DISCUSSION

The researchers attribute this development in the level of mechanical variables to the development of the physical abilities of performance through various and different exercises. This is according to the indicators of the time characteristics related to the last three steps of the ground to approach. They are the steps carried out by the jumpers by using jogging exercises in the form and the firmness of hops, jumping with feet and on terraces and various other methods aimed at developing the main physical abilities.[10]

The speed of performance, explosive force, the strength of the speed. Those are needed by the high-jumper with the apparent improvement in the mechanical variables of the last three steps of the jogging arc in the approximate run (contact time) as the evolution of these variables is associated with the time of the performance of the three steps. This comes through the development of the force spent during this time unit with emphasizing the performance angles of these steps, which have an active role in their improvement with the relative decrease in the time at which they occur.[11] The force spent and reduction in contact time affect the length of the step and the foot's leg, as well as its effect in the performance of the next steps and the stage of upgrading. They also produce rapid successive movements in other parts of the body in these steps through the appropriate consistency of the type of effectiveness reached by the high-jumping players between the production of strength and speed suitable for the type of performance and the moment of upgrading which influenced the momentum of the steps and therefore the length of the step and its time. [12]

So, all of this is clearly focused on the moment of the upgrading. "The adoption of performance-type exercises that help in the development of the work of muscles working in running leads to improving the level of speed of the jogging steps and thus the maximum speed.[13] This is what we hope in the training process. The researchers confirmed the training of the pushing during short time moments. i.e.[14] pushing the muscle force, especially the muscles of the legs. They used different exercises in a form of (resistance) using different distances and heights, and using different terraces and tools to help and training equipment commensurate with the type of activity and the special stages that would be developed.[15] The conditions of disability can be developed by the development of the momentum and the taking off. This leads to the improvement of the step-length and thus reduces the number of steps with the relative improvement of the frequency.[16]This was confirmed during the training units in order to reduce the time of the steps (contact-moments and length of time) to suit the type of performance. The use of force

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in relatively short periods of time has the effect of pushing greater force,[17]and speed events as in approximate running with force in a short period of time has a greater impact than if it is used in a long period of time. [18]

The situation of the body and the correct performance-angles of the body suitable for the nature of the activity means that the body in the moments of contact is in the best situation. This means the least amount in the resistance-torque (weight-torque) and this is what we hope for moments of running and upgrading in high jump. If these angles are said to be less than the natural limits, this causes swallowing the centre of the body's weight away from the gravitational line. This results in an increase in the resistance torque of the body.[19] The suitability in the work of these angles and the exercises that were subjected to the sample, which confirmed the performance of these stages according to the time characteristics related to the type of performance led to the improvement of the level of these variables and the physical abilities of these stages. The increase disputing speed of the approximate run leads to improve the level of central muscle contraction of the muscles of the material to the jumper foot and thus increasing the momentum between the foot and the ground and increasing the instantaneous speed leading to increase the momentum.[20] This is what happens during these moments. It is achieved only by the presence of an integrated ideal performance during the parts of the movement for these stages and their impact on the later stages, which is the upgrading-stage in particular.[21]

Therefore, performing these variables has an impact on the resolution of the level of achievement. The integration of the correct performance of the angles of approach, pushing and upgrading the solution of ideal times suitable for the nature of performance affects the achieved distance. This is what is aimed to be achieved at the training process to raise the level of Athletic achievement. Performing perfect angles at contact moments has a role in losing or saving the speed gained during the approximate run. These angles occur during the touch of the foot to the ground and then leave it. It also affects the upgrading-stage, during which the jump distance is determined i.e. the height of the jump in the high jump.[22]

Also, the researchers attribute the reason for this development at the moment of upgrading to the various exercises that emphasized the development of this stage in terms of temporal characteristics. This is in order to integrate the correct performance at the moment of upgrading in terms of instant strength, times, angles and conditions of the body with focusing on the right mechanical steps for the steps that precede this stage. The methods of jogging make the legs-muscles more consistent and responsive to muscle reactions in moments of instantaneous force lifting with the ground.

Also, the increased linear and horizontal momentum resulting from rapid running changes the movement of the corners and the body joint. This allows the movement of power smoothly and economically. Therefore, the trainings used in the training curriculum using auxiliary tools integrated with the technical performance of the activity and characterized by the fast character and high motor performance as the strength of the speed is highly related to the technical performance and the higher the degree of technical performance the higher the level of compatibility within the muscle and the motor outputs have improved.[23]

So, the development of the three steps develops with the physical abilities of this stage, such as the development of the strength of the distinctive speed emphasizing the exertion of force of the contact-moments in the least possible

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time. This leads to the correct flow of the force used between the parts of the body and the parts of movement taking the player to the correct performance at the moment of upgrading. The overcoming resistance in the performance of a certain movement and accomplishing it at the maximum speed or the shortest possible time is a benefit to the explosive force. For this reason, these exercises contributed significantly to the development of muscle ability in jogging and jumping movements that depend on shortening the time-period during which a foot deals of the ground during the approximate run and the ideal time use of the moment of upgrading.[24]

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