

## THE EFFECT OF USING A PROPOSED TOOL IN ENHANCING PERFORMANCE & ACHIEVEMENT LEVELS DUE TO SOME BIO-KINEMATIC VARIABLES OF THE JAVELIN THROW

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### Abstract

The current study aims to identify the effect of the proposed tool in enhancing performance and achievement levels due to some bio-kinematic variables of javelin throw. Both researchers suggested that there is a positive effect of using the proposed tool on performance and achievement levels in javelin throw for the sake of the empirical group as they used the empirical method because it fits the nature of the study. The sample of the study was chosen from the first year students in the academic year 2012 – 2013. They were 24 students divided into two equal groups (12 students each). The researchers designed a proposed tool to learn and train javelin throw on 15 educational units starting from the first introductory unit till the last unit in two units per week. Data were statistically processed using arithmetic means, standard deviations and the T-tests for related and equal samples. As for conclusions, the study showed a clear positive effect in enhancing and developing some angles of the body especially body inclination angle and launcher angle. This was shown from results of mechanical analysis of javelin throw skill which, in turn, was reflected in developing achievement.

**Keywords:** Effect of the proposed tool, enhancing performance and achievement levels, developing some bio-kinematic variables, javelin throw.

### 1. INTRODUCTION & IMPORTANCE OF THE STUDY

The use of helping methods and tools in learning and training adds many experiences to learners with a high degree of performance mastering. Achieving high achievements in many sports is the goal which all athletes seek. To achieve this goal there should be a use of various types of methods and tools for athletes to depend on during learning various basic skills. Therefore, bio-kinematics is one of the sport sciences which contributed to great progress and development in sports in general and track and field games in particular represented in the study of reasons of movements and describing it using kinetic analysis depending on modern scientific appliances and methods to reach high achievement in various sport events.

The javelin throw is characterized by complex and hard performance as it is affected by a lot of aspects such as high fitness in terms of speed, flexibility and mechanical variables inside different parts of the body (arms, legs and trunks). Hence, the researchers resorted to use a proposed tool for athletes to depend on during learning kinetic performance. It is a scientific attempt to discuss scientific and training alternatives and methods related to kinetic performance. Therefore, this study is important in determining the effect of exercise using the proposed tool as a helping means in enhancing and developing performance and achievement levels for the first year students as well as accurate description of movement and showing its strength and weak points to raise the level of kinetic performance level in javelin throw.

#### Problem of the Study

Through the experience of both researchers in learning and training in track and field games, they noticed that students find difficulties in learning and mastering kinetic performance of javelin throw as it requires accurate and complex consistency of all body movements as well as angles of performance which causes an increase in time and effort during learning this game. Despite the presence of good educational and training courses, it is restricted to use modern appliances and tools as they have an effective role in providing teachers with important and accurate information about details of the skill, motivations and modification of kinetic behavior. Here, comes the problem of the study in identifying how effective this tool is in helping enhance performance and achievement levels in javelin throw. This, in turn, leads learners to be economic in the needed time and effort for quick learning due to some mechanical variables of performance and achievement levels.

**Objectives of the Study**

- Identifying how effective the proposed tool is in enhancing and developing performance and achievement levels due to some bio-kinematic variables in javelin throw.
- Identifying differences in pre and post tests in performance and achievement levels due to some bio-kinematic variables in javelin throw.
- Identifying differences in post-test in performance and achievement levels due to some bio-kinematic variables in javelin throw.

**2. METHODOLOGY**

Both researchers used the comparative empirical method as it is proper to the nature of the study.

**Community and Sample of the Study**

Community of the study consists of first year students for the academic year 2012 – 2013 in the Faculty of Physical Education – Tikrit University. The sample (13 students) was chosen randomly from section (C). After eliminating 7 students (4 in the exploratory experiment, 2 failures and one injury), the total number of respondents became 24 students divided into two control and empirical groups (12 students for each group). The researchers took into account samples should be similar and equal in variables of the study.

**Identification of Groups of the Study:**

To ensure identification and similarity of the sample, the researchers used the T- value in some variables of the study.

**Table (1) shows arithmetic means, standard deviations and the (T) value for the variables of the study:**

Tests	Measure unit	Control group		Empirical group		T counted value	T table value	Significance level
		Mean	S.D	Mean	S.D			
Age	Year	20.75	1.28	20.66	1.15	0.17		insignificant
Length	Cm	173.83	6.47	176.25	4.39	1.02		insignificant
Weight	Kg	71.25	7.26	72.00	4.69	0.28		insignificant
Approach speed	m/s	2.98	0.59	2.85	0.48	0.59		insignificant
Body inclination angle	Degree	6.42	0.81	6.20	0.65	0.70		insignificant
Launcher angle	Degree	28.16	1.93	27.08	4.52	0.77		insignificant
Achievement	m/cm	24.03	2.16	23.10	2.77	0.88		insignificant

**The Proposed Tool:**

Before starting designing the tool, the idea was discussed by the researchers and some experts and specialists in the field of kinetic learning and sport training to benefit from their scientific notes about the project. Both researchers created a clear and studied idea based on scientific principles in addition to saving time and effort for student teachers.

**Components of the Proposed Tool:**

**The Head** – a round circle (radius 1.50 m) including (5 cm) fixed with a handle and (30 cm) to be put in the middle post.

**The Body** – middle post (diameter 7 inch and 2 m tall) on which the bottom base of the tool is fixed with divided degrees to enable control raising and lowering the circle (slight) meaning that there is a shaft inside a shaft (the least diameter).

**The Base** – the bottom base of the tool is an iron triangular base consisting of three iron posts (diameter 5 cm and 50 cm tall) to keep the consolidation and balance of the tool with fixing the middle post inside the shaft.

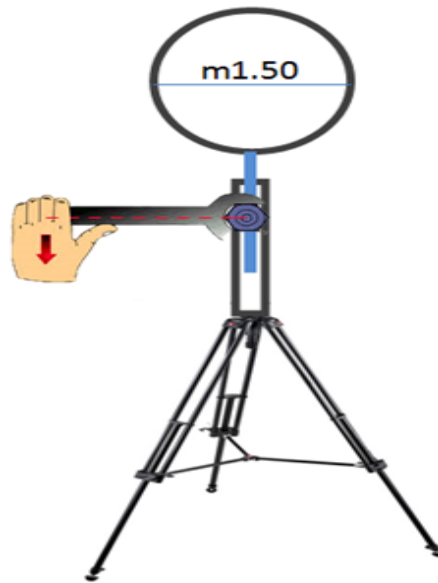


Figure (1): components of the suggested tool

#### How to operate the tool

- The student stands in front of the tool on a suitable and different distances, and then he throws the javelin inside the circle from a stationary position then gradual movement and throwing.

#### Purpose of the tool

- Saving time and effort in learning and training
- Taking correct positions for the throwing arm of the javelin concerning throwing angle
- Through raising and lowering the circle, approaching and moving away the tool from the student, he will be able to master the movement path of throwing

#### Field procedures of the study

##### Pre-Tests

After giving (3) introductory units for the sample member to explain, showing stages of performing javelin throw and legal aspects, the researchers performed the pre-test on 12/03/2013, corresponding Tuesday, by giving (3) attempts to each student and counting the best of them using legal javelins (8000 gm) recording the throwing distance for each attempt as well as video recording.

##### Main Trial

To start procedures of the study, the researchers followed the following steps:

- Applying the main trial using educational and training units represented in explaining technical performance of javelin throw, using detailed pictures and displaying some educational films as a helping means in education for both control and empirical groups.
- Applying educational units from 03/03/2013 (15 units) from the first introductory unit till the last unit on 21/04/2013.
- The empirical group used the proposed tool in learning and training, while the control group used the traditional method used by teachers of the subject.
- Applying two educational units in the week (Sunday and Tuesday) in duration of 90 minutes. Units were divided into (preparation section, main section and final section).
- The researchers used some special exercises that serve the performance and some appliances and tools such as medical balls and javelins with different weights (600 gm and 700 gm).
- The researchers determined some bio-kinematic variables that will subject to analysis by returning to some scientific sources as well as the experience of both researchers being coaches of track and field games.

#### The measured kinematic variables:

After reviewing sources and studies related to javelin throw, the researchers found that the most important kinematic variables that can be used as guides in evaluating technical performance are:

- Approaching speed

- Body inclination angle
- Launcher angel
- Numerical achievement

#### How to Measure the Study's Kinematic Variables

- Measuring approaching speed (the last two steps) by step length and duration.
- Measuring body inclination angle (the angle between the body's longitudinal axis and the vertical line at the moment of touching the forefoot the ground) by the two sides of the angle.

**Launcher Angle:** it is the angle between the total launching speed and the horizontal line.

- Numerical achievement: throwing distance for each successful attempt was counted by measuring (m/cm)

#### Post-test

After completing educational and training units of javelin throw, (15 units), post-test (for technical performance and achievement) was performed on the control and empirical groups on 23/04/2013, Tuesday, giving three legal attempts for each student and counting the vest of them.

#### Video Recording

The best way to get information is analysis via video recording through which movement, its paths and mechanical variables are studied. The researchers used video recording to describe and analyze movement by fixing the camera on a big three-side holder on a distance of 1 m, height of 1.30 m and frequency speed of (60 images/s). This process was performed in the place dedicated to javelin throw field to get data about mechanical variables of javelin throw, and then studying and analyzing them to achieve goals of the study.

#### Kinetic Analysis

1. After ensuring video recording procedure and clear resolution of images, the best attempt concerning achievement distance performance will be analyzed scientifically by using Kinovea program for kinetic analysis. This program is characterized by kinetic paths although it needs quick cameras as in the figure.



Figure (2): Front of the Kinovea program for kinetic analysis

### 3. RESULTS, DISCUSSION AND ANALYSIS

#### Results of pre and post tests for the control and empirical groups:

**Table (2): arithmetic means, standard deviations and T- value for variables of the study for the empirical group:**

Statistics Variables	Measure unit	Pre-test		Post-test		T counted value	T Table value	Significance level
		Mean	S.D	Mean	S.D			
Approach speed	m/s	2.85	0.48	4.63	0.40	8.53		Insignificant
Body inclination angle	Degree	6.20	0.65	9.33	0.52	9.80		Insignificant
Launcher angle	Degree	27.08	4.52	34.58	0.88	12.51		Insignificant
Achievement	m/cm	23.10	2.77	40.99	2.07	17.66		Insignificant

**Table (3): arithmetic means, standard deviations and T- value for variables of the study for the control group:**

Statistics Variables	Measure unit	Pre-test		Post-test		T counted value	T Table value	Significance level
		Mean	S.D	Mean	S.D			
Approach speed	m/s	2.98	0.59	3.26	0.54	4.13		Insignificant
Body inclination angle	Degree	6.42	0.81	9.43	0.42	12.46		Insignificant
Launcher angle	Degree	28.16	1.93	42.93	2.49	16.90		Insignificant
Achievement	m/cm	24.03	2.16	34.75	2.62	3.55		Insignificant

Significance level: (0.05) and freedom degree: (11)

**Results of post-tests of empirical and control groups:**

**Table (4): arithmetic means, standard deviations and T- value for post-tests for the control and empirical groups:**

Statistics Variables	Measure unit	Pre-test		Post-test		T counted value	T Table value	Significance level
		Mean	S.D	Mean	S.D			
Approach speed	m/s	3.26	0.54	4.63	0.40	6.85		Insignificant
Body inclination angle	Degree	9.43	0.42	9.33	0.52	0.71		Insignificant
Launcher angle	Degree	42.93	2.49	34.58	0.88	4.66		Insignificant
Achievement	m/cm	34.75	2.62	40.99	2.07	6.20		Insignificant

**4. RESULTS DISCUSSION**

**Discussing results of post-tests for the control and empirical groups**

Tables (2, 3) show that the counted T value was higher than T table value (3.44) in all variables of the study and in control and empirical groups. The researchers found that the reason for significant differences among members of the empirical group regarding these variables is that the proposed tool applied on the sample of the empirical group has helped in enhancing and developing performance level due to some mechanical variables of javelin throwing through the focus on thrower's position and forearm movement as this helped to get correct feeling of movement. In addition, consistency movement between back legs movements, body posture and pushing it forward in the throwing step by raising the circle (tool head) with a level suitable for throwing posture. Moreover and tool position, whether near of far from the thrower, increased his own susceptibility to focus on throwing. Frequent training on throwing from a point inside the circle and using approaching speed from various distances in each performance contributed effectively in achievement as well as developing muscular strength for muscles working on the arm. This aims to achieve

suitable mechanical and physical goals for kinetic performance of the approaching stage. Developing this stage is one of the important stages in the ability to control the final speed of the throwing and launching positions as “approaching speed requires controlling movement amount with a great muscular strength to change into the post-approaching stage. This means increasing application difficulty, so this process helped enhance performance level and achievement through consistency in kinetic performance path for javelin throw.

Further, there are high significant differences in the variable of body inclination angle for the empirical group’s members in pre and post tests, while differences were insignificant for members of the control group in post-test due to regular exercises used in the educational method, using the proposed helping tool, achieving proper position for the body at the moment of preparing to throw. In addition, taking proper position for the body is one of the basic requirements of throwing, so a thrower should be consistent with his body position at the moment of throwing with requirements of speed and strength of the forearm, body weight center speed and the rest of body parts and javelin launching speed. Therefore, this tool contributed greatly to enhance other total mechanical variables that affect achievement level through good consistency in various muscular points in upper, lower limbs and trunks. There was a high significant difference for the sake of empirical group in launching angle variable. The researchers think that using the helping tool made clear development in the post-test which led to effective mechanical means included in the educational method as they were applied by an accurate scientific way. Moreover, suitable launching angle is one of the important and effective mechanical means at the horizontal scope through the throwing bow and the posture of the throwing arm with back flexibility are the causes of forming this angle. (Hossam Eldin, 1993) thinks that if a player changed the height or speed of the tool, the angle which he throws with should change automatically. In addition, there are factors that may affect launching angle such as body potential, height point and launching speed of the tool, so the helping tool sought to make members of the study sample to focus on a certain point in each throwing attempt as many researchers refer to the important relation between the angle, launching speed and distance. Results showed that the most suitable throwing angle gives the farthest distance if the arithmetic mean of throwing angle in the pre-test for the empirical angle (27.08), while in post-test (34.58).

This is clear evidence on the improvement of performance level especially in launching angle. It is known that the optimal angle of throwing is between 30 and 37 degrees, so this tool achieved its goal of enhancing performance level and achievement as well as being suitable to the level of the study sample members and helped in developing good kinetic body consistency. Using helping tools contributed to make positive educational process in correcting body postures and movements. As for members of the empirical group, there are clear significant differences in some variables due to physical exercises suitable to the level of the control group’s members. Progress rates in these variables were great which means enhancing performance level was because of implementing suitable educational units and helping tools. However, there is weakness in performance level in terms of body inclination angle and the researchers think that body control will need longer throwing path to make achievement, so there was weakness in achieving good consistency among various parts. The flexibility and strength in shoulder muscles in the throwing arm, stomach muscles and the back helps the thrower take the best postures in correct direction of the javelin with launching angle, so the sample of the study did not manage to make good use of it which had a positive effect on performance level and achievement through kinetic analysis to diagnose some technical and mechanical errors of a javelin thrower.

## 5. CONCLUSIONS:

- Exercises that were performed by the proposed tool led to develop performance level and achievement due to some mechanical variables of javelin throw.
- There are clear significant differences in enhancing the level of performance including launching angle for the empirical group members.
- Using the proposed angle contributed effectively in mastering the throwing posture and developing movement and strength of the throwing arm.
- Using the educational method in the proposed tool helped the empirical group members understand and perceive connections of various body parts.
- There is a significant difference and a great development in performance level for the empirical group members.

## Recommendations:

- It is necessary to use helping tools in educational units as they have a positive effect on developing performance level and achievement.
- It is necessary to use and design proper helping means and tools to cope with the abilities of members of the study sample with other games.
- Ensuring body inclination angle the moment of throwing as it is important in achieving goals of throwing positions.
- Ensuring the launching angle as it has a great effect that determines kinetic path of throwing.

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