USING A TECHNOLOGICAL (PC and Laser) MOVABLE SYSTEM TO PROVIDE IMMEDIATE INFORMATION TO PREDICT JAVELIN THROW DISTANCE[1]

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INTRODUCTION:

Sport has become in all sectors closely linked to the use of technology. The use of the computer with modern instrumentation has now become a medium of instruction in many areas of sports, by which assist in the process of assessment and forecasting directly and objectively.

Learning, in recent time became an investment process which connect with production and economic abilities, so far the era of time that we live am moment involve with explosive knowledge in all aspects of our life.

Sport and physical education, become strongly connected with technology and know how using computer with new measuring devices become more familiar with learning and training methods. Gesse (1992) and Daugs (2000) believes that could help to get fast information about sport performance. Grosser (1982) indicates, that feedback information about athlete movement were very fast (20-30s) when such fast information come directly it would be better to store movement information in athlete memory.

The methodical approach of fast objective feedback information can be justified by the fact that self information and subjective

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perceptions of the movements are consciously compared with the objective information from the outside (Farfel 1977).

For javelin the high speed of the movement in the release phase causes problems for athletes, coaches and researchers, because feedback on movement performance is hardly available. Usually the athlete receives only feedback in form of throwing range. Since e.g. indoors the necessary area is not always available for appropriate throwing ranges, alternatives for this special purpose must be developed.

The throwing phase in Javelin event is the basic technical phase which leeds to sucsses. The basic accelaration stage which start from duble takeoff position till release the Javelin as Tutjowitsch (1969) and other indicates as it shows in Fig. 1 according to the Joch (1993).

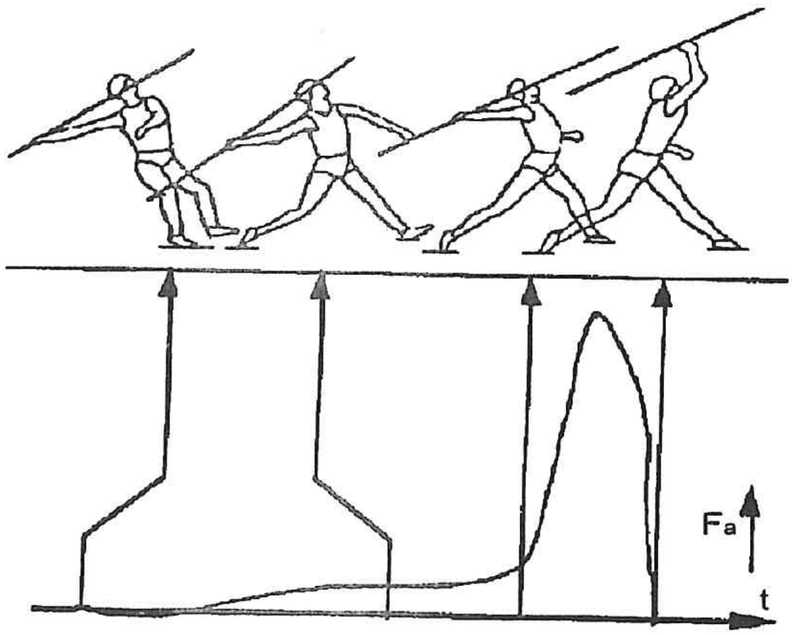


Figure 1: Delimitation and characterization of the final force employment in the release phase (JOCH 1993, 172)

The arching of back movement on the horizental axle when the contraction of side and Abdominal muscles moved fastly and that create maximum Vo, when Vo connecting with throwing distance (0.92) that considered by Bartonietz (1987) as the main variables which infleunce the throwing distance.

1) Speed of throwing.
2) Throwing Angle.
3) Flaying angle.
4) High of throwing point.

Göner (1999) and Ballreich (1986) both indicate that throwing distance infleunced with many complecated mechanical variable like Vo speed of throwing ,ao angle of throwing, ho high of throwing point as Tutjowitsch (1969) indicated.

$$D = \frac{v_0^2}{g}\cos\alpha_0\left[\sin\alpha_0 + \sqrt{\sin^2\alpha_0 + \frac{2gh_0}{v_0^2}}\right]$$

g Acceleration α_0 Angle of Throwing h_0 High of throwing point D Distance v_0 Speed of throwing

When the main objective is to achieve more distance, the athlete should have the principle of Biomechanics and some important characters such as the angle and speed of throwing movement. The studies of Hiz (1991) and others shows that the velocity of speed was more infleunce in throwing distance which reached 30m/sec for male 27m/sec for female, such informations sems to be very difficult to get and evaluate through vision of movie analysis due highly speed of movement, see Fig. 2 that shows the ideal throwing angle were 38 for male athletes and 34-36 for females athlete, according to schwuchow (1986) and others measurements.

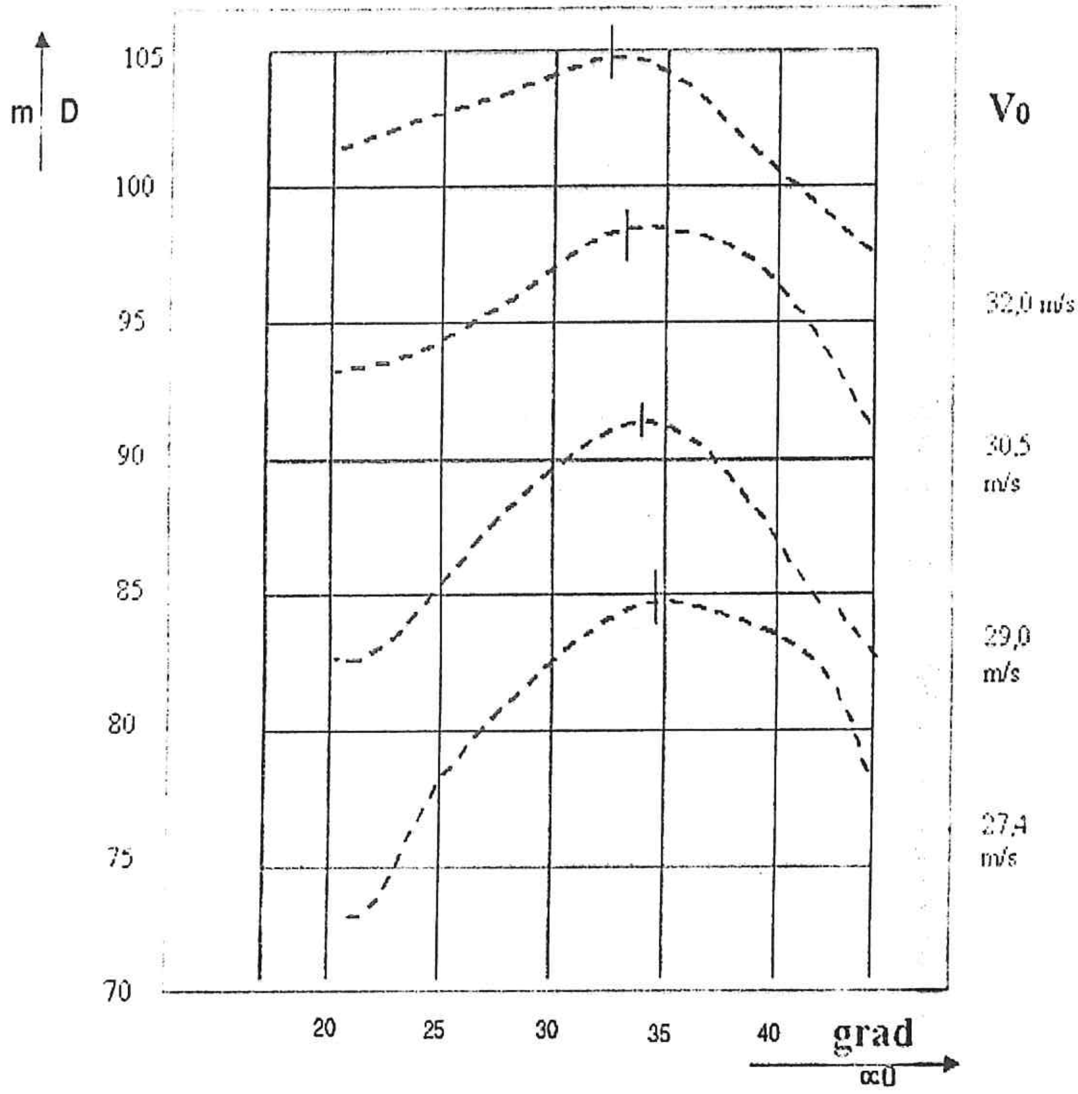


Figure 2: Relationship between D, α_0 and V_0
(Schwuchow 1986, 12)

Sport history development of the Javelin

With the beginning of the 20th Century and its increasing organization of the sport has evolved over the decades, the javelin throw technique more and more improved. This is also good to pursue the permanent increase in javelin throw distance Table ١.

Tab. 1: **The development of records in javelin throw (800 g)[2]**

Distance (m)	Name	Date
50,44	ERIC LEMMING (SWE)	31.08.1902
62,32	ERIC LEMMING (SWE)	29.09.1912
71,01	ERIK LUNDQVIST (SWE)	15.08.1928
77,23	MATTI JÄRVINEN (FIN)	18.06.1936
78,70	YRJÖ NIKKANEN (FIN)	16.10.1938
80,41	BUD HELD (USA)	08.08.1953
85,71	EGIL DANIELSEN (NOR)	26.11.1956
91,72	TERJE PEDERSEN (NOR)	02.09.1964
93,80	JANIS LUSIS (URS)	06.07.1972
94,08	KLAUS WOLFERMANN (GER)	05.05.1973
94,58	MIKLOS NEMETH (HUN)	26.07.1976
96,72	FERENC PARAGI (HUN)	23.04.1980
99,72	TOM PATRANOFF (USA)	15.05.1983
104,80	UWE HOHN (GDR)	20.07.1984
shift of focus of the javelin from 1986		
85,74	KLAUS TAFELMEIER (GER)	21.09.1986
87,66	JAN ZELEZNY (TCH)	31:05.1987
89,10	PATRIK BODEN (SWE)	24.03.1990
89,58	STEVE BACKLEY (GBR)	02.07.1990
91,46	STEVE BACKLEY (GBR)	25.01.1992
95,54	JAN ZELEZNY (CZE)	06.04.1993
95,66	JAN ZELEZNY (CZE)	29.08.1993
98,48	JAN ZELEZNY (CZE)	25.05.1996
94.02	Jan Zelezný (TCH)	26.3.1997
90.88	Aki Parviainen (FIN)	11/06/1998
93.09	Aki Parviainen (FIN)	26/06/1999
91.69	Konstadinós Gatsioúdis (GRE)	24/06/2000
92.80	Jan Zelezný (TCH)	12/08/2001
92.61	Sergey Makarov (RUS)	30/06/2002
90.11	Sergey Makarov (RUS)	30/05/2003
87.73	Aleksandr Ivanov (RUS)	31/05/2004

[2] http://www.dlv-sport.de/ERGEBNISSE/weltrekordentwicklung.shtml

91.53	Tero Pitkämäki (FIN)	26/06/2005
91.59	Andreas Thorkildsen (NOR)	02/06/2006
91.29	Breaux Greer (USA)	21/06/2007
90.57	Andreas Thorkildsen (NOR)	23/08/2008
91.28	Andreas Thorkildsen (NOR)	28/08/2009
90.37	Andreas Thorkildsen (NOR)	29/05/2010

The results presented in Tab. 1 Records in javelin throw since 1902 are shown in Fig. ٣ once again plotted in their course.

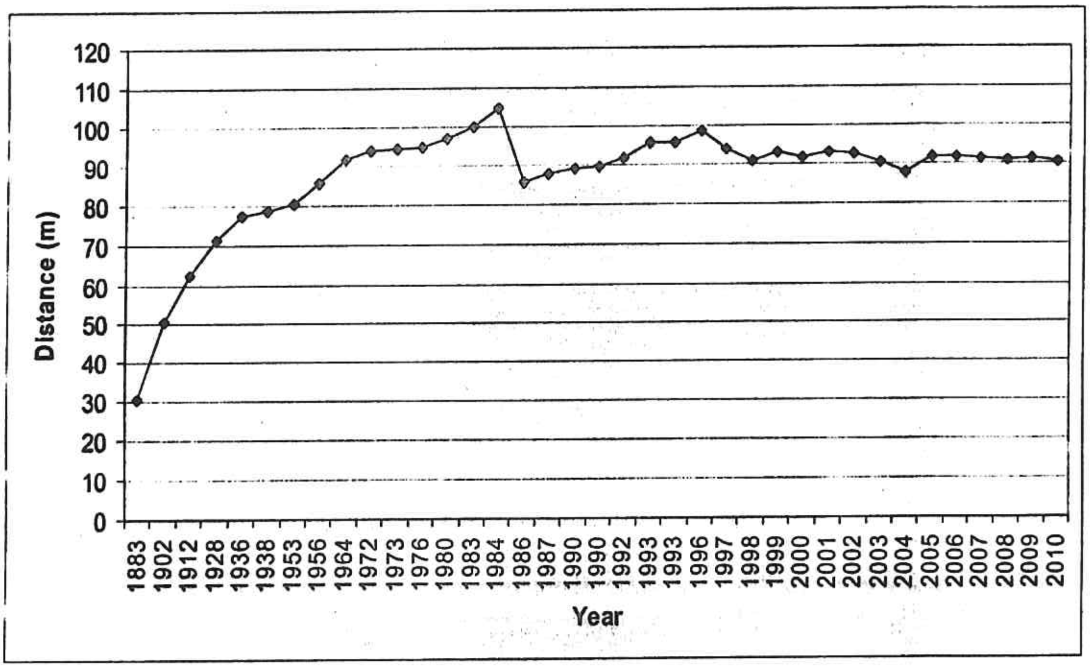


Figure 3: Diagrammatic of records in javelin throw **(See Tab. 1)**

Not just the throwing technique, but also the material had influence on the achieved javelin performance. 1953 „Bud Held“ (USA) get the javelin (wood), Which increased the ability to fly horizontally, and paying the javelin left. In 1954, he then developed a variant of metal, which could be thrown further.

Due to the technical, material and training-progress, the IAAF had to make several regulations to prevent large and thus dangerous throws in athletics stadiums. With this technique, the javelin could be thrown for over 100m. The 100m line was then crossed again in 1984, after which the IAAF setting out a new regime for the javelin Construction. "In response to this wide-open spaces was moved by a rule change from 01.04.1984, the focus of the javelin to 4cm in front, which had reduced widths, hitting a steeper and better selection options than in the peer Sail result (Jonath 1995 et al.). As of 01/01/1992 it has banned any roughening of the javelin so that a smooth surface and required characteristics without any user intervention. Since 1996, the permanent improvement of the record in the javelin is stagnating. It seems as if an increase in the javelin throw performance in the context of regulations is hardly still possible.

In recent decades, the sports science discipline in track and field javelin throw on the optimization of a perfect throwing technique and their training is concentrated. The following summarizes the current state of knowledge of the movement structure, javelin throw technique, physical parameters of the javelin throw and the use of special rapid information in the context of the development and improvement of the javelin performance is presented, see fig. 4.

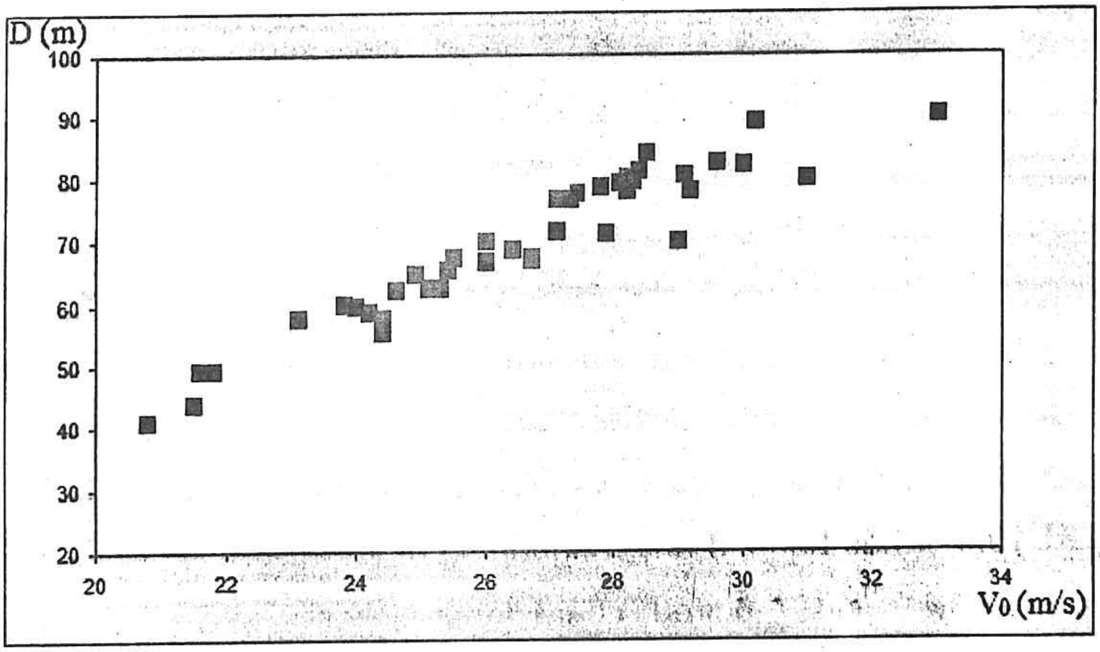


Figure 4: Relationship between D and V_0

Also Fig. 4 shows the relationship between throwing distance and speed velocity during javelin competition which reached 0.95 positive significant.

THE RESEARCH OBJECTIVE:

The objective of this research is use movable technological system to provide immediate information to predict javelin throw distance.

RESEARCH HYPOTHESIS:

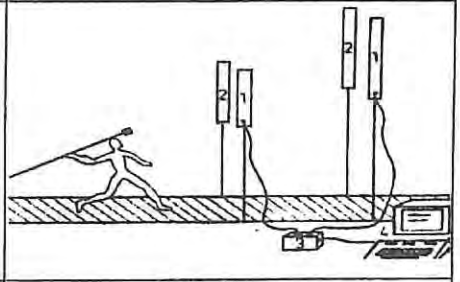
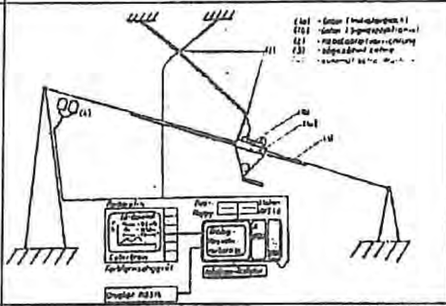
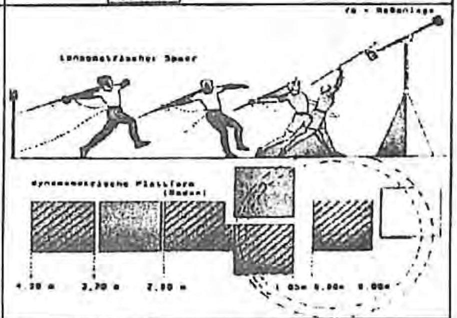
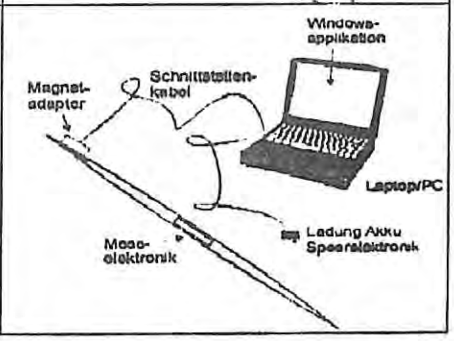
According to the research objectives, the research hypothesis assembeld as the following question.

Could we expect the distance performance (D) in related to the speed velocity of Javelin event using technological movable system (V_0g)?

INFORMATION IMMEDIATELY IN THE JAVELIN THROW:

The previous research findings was an indicator to discuss all the mechanical systems in Javelin events that researcher put them according their manipulate date in Tab. 2.

Table 2: Work for biomechanical high speed information in the Javelin Throw

Author	Para-meter	Measuring method	Principle sketch
Viitasalo, J., Korjus, T. (1987)	V_0 , α_0	Light cells	
Köllner, J., Dörr, J., Wiese, G. (1989)	V_{max} , S_a , $V(t)$	receiver of acceleration	
Adamczewski H. (1995)	V_0 , α_0	Light cells	
Schmucker, U., Warnemünde, R.; (2001)	V_0 , S_a	velocity sensor	

To Tab. 2: Viitasalo / Korjus study (1987) is the first in the literature, in which the method of supplementary objective for Quick-javelin throw, was based on the measurement of javelin throw specific parameters. In particular, the comparison between the traditional control method based on subjective information and complement the biomechanical control method using Quick-objective to achieve an optimal flight speed of the spear is an important contribution to the principle of complementary objective information immediately.

Objective of the study by Viitasalo / Korjus (was 1987), is available at the training hall, an indirect feedback of kinematics parameters of the spear at the moment of the explosive. Measurement methods are two photocell gates, which are coupled to a microcomputer. The system used measured the take-off speed and the angle at the forefront.

Objective of the study by Köllner et al. (1989) was information immediately on strength training equipment javelin throw. Applications are performance-based diagnostics for investigation of special abilities and the power structure of movement in test litters. To control the movement sequence, the amounts immediately after any attempt to throw litter sled series displayed parameters maximum velocity and acceleration travel Sa, Vmax and the characteristics of the velocity-time curve v (t) used to read off the trainer from the screen and transforms it into verbal information for the athlete .

The Strength Training javelin machine, by Köllner et al. (1989) was used, today, in Hall, where it is still used to perform diagnostics in the javelin throw. Advantage of this device is fast and objective, and comprehensive diagnostics of physical parameters (acceleration, maximum ejection velocity) of the javelin throw, which can be plotted in their course. In addition, you can use by changing the weight of the litter carriage (up to 30 kg), the device primarily to train conditional special abilities. Disadvantages are the lack of mobility, because of the inpatient building and the enormous physical size. In addition, the javelin throw specific motion is not sufficiently simulated, as is the acceleration of the sled's throw from a sitting position.

Objective of the study by Adamczewski (1995) is the determination of motion parameters with the throwing device and the improvement of sporting equipment by biomechanical Quick Information. Measurement techniques are dynamometric platforms for measuring the acceleration of the pulse pressure leg, visual support of video recordings to the side and behind the athlete, possibly with Third Camera from above, safety net and measuring the initial velocity of the throwing device using sensors. The tester offers its extensive dynamometric equipment for capturing the last three points before dropping, and the pair with a javelin Light cells new extended conditions for the investigation of special javelin throws and throwing exercises.

By Vitasalo / Korjus (1987), and Adamczewski (1995) used systems based on photoelectric measurements are in their mobility and the experimental design, insofar as one considers only the photoelectric measurements, very beneficial. Also here are also very fast information about dropping parameters (take-off speed, angle) are available. The disadvantage of these systems is the high financial burden on the photoelectric investigation. After consulting with several companies amount to the production rates of at least 6000 €

and are open upwards, and these depend on the ability of the accuracy of the systems.

The system of Javelin analysis compared to the previously mentioned systems, which combines the most beneficial in itself, is that of Schmucker et al (2001). Since this was not published until a time when the planning and development of their own information immediately system almost complete, this should serve only as a supplement. It allows the Javelin analysis using acceleration and velocity measurements from the start to discharge, with a relatively low cost of materials (special velocity sensor, interface cable with adapter, PC or laptop) with analysis software. In addition, the system has great advantages in structure and mobility.

The system price by Schmucker et al. (2001) is given by the Fraunhofer Institute in Magdeburg, is therefore compared to other systems, relatively inexpensive. Another advantage proves to be also the possibility of full implementation of the start and the shedding motion. The disadvantages of the system are both in the partially restricted use of rapid information as possible, sometimes it goes some time to spear, and laptop / PC connected to each other and displayed data, and the other in the unilateral application of possibility which exists solely in the javelin analysis.

RESEARCH METHOD:

The descriptive style is the suitable one for this research and to study also the relationship between distance performance and speed velocity to predict distance performance.

Subjects:

There were 20 male athlete, selected as randomly from college of sport education in Assiut university, Egypt.

Procedure:

A technological Movable system for immediate information in the Javelin throw:

A movable technological system for the analysis of the javelin technique was developed, which consisted of a 800g sledge to be accelerated along a rope and a LAVEG measure unit. Takeoff angles can be adjusted within the range of 26 - 40 degrees. The takeoff height can be likewise adapted to the individual conditions of the athlete. By a laser-steered measure unit (LAVEG) the speed of the throw carriage can be determined. Due to the high relationship between release velocity and throwing range in javelin the release velocity of the simulated javelin throw serves as indicator of the throwing performance. This information can be provided as feedback within 5 to 10 seconds on a screen.

Basic approach

The basic idea of the simulation, the acceleration of a javelin throw javelin model is used on an inclined plane. A tube functions as a model of a spear and is located on an approximately seven-meter-long rope. The rope is) between two fixed points at different heights tense (inclined plane. The spear model (tube) can slide freely between the two points, so that the javelin thrower this speed with the hand in the direction of the elevated point. So that the athlete will be given the option of dropping technique of the javelin to exercise control on the model (Fig. 5).

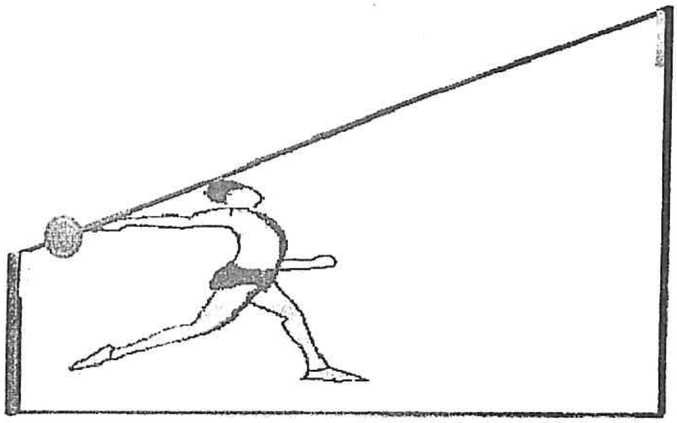


Figure 5: The technique of the javelin throw on the model

In addition to simulating the dropping technique should be both rapid and quantitative statement about the speed of the javelin throw model possible in order to meet the demand to use the unit as a rapid information to. The problem of velocity measurement is achieved using a laser measurement device (LAVEG), the distance by measuring the javelin throw model in relation to the laser facility in a position to determine the dropping during simulation, the values for these physical parameters. However, this can only be done in conjunction with an appropriate software (DAS3) and hardware (PC or laptop).

The entire system consists of 3 parts as Hassan (2004) indicated:

1. Including steel rods and litter sled.
2. LAVEG laser speed device and special software (DAS3 - Program) for the electronic evaluation.
3. PC or laptop.

Software DAS3

The LAVEG is connected to a PC or laptop using the DAS3 - program, which was also developed by the company JENOPTIK can thus very quickly about the speed of the throw will be seen and evaluated immediately after the sled test on the screen (Fig. 6).

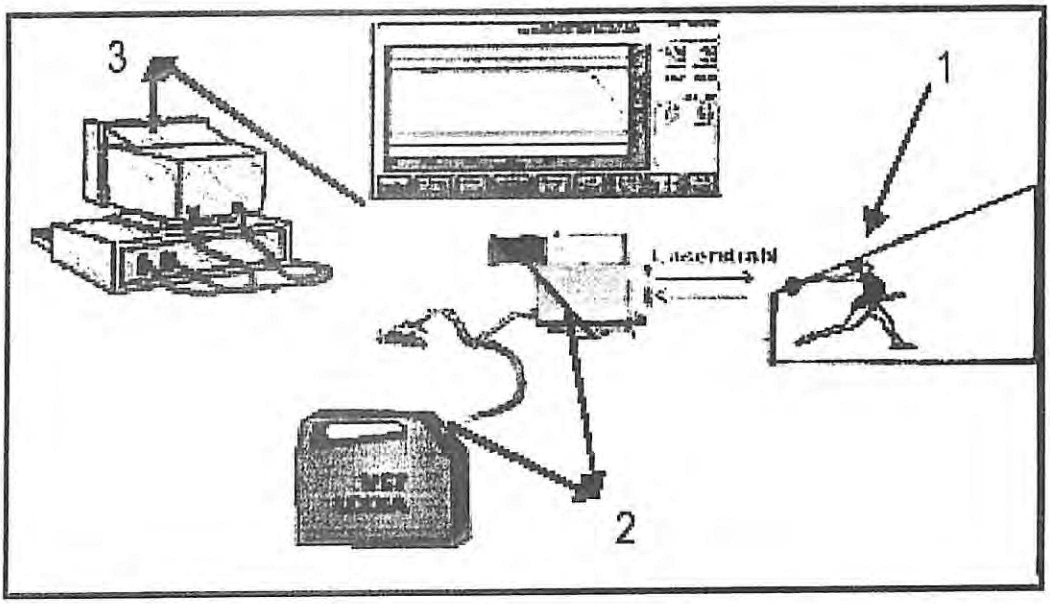


Figure 6: Digital technology for immediate information in the javelin throw (Hassan, 2004)

Later in the program are DAS3 data on the screen numerically and graphically and presented with various additional information to determine the relationship between speed and distance to time, and speed to time with diagram chart to describe this relationship on the axle Y,X according to which shows the connection of those parts within 10 sec. (JENOPTIK, 2000).

Statistical analysis:

Version 11.5,spss used to analyses the raw data according to Bortz (2005).

DISCUSSION AND FINAL RESULTS:

With the help of linear regression, we can now directly relate to each other 2 parameters. In the subsequent regression is expected to be predicted with any other characteristic feature of X and Y, the connection can be represented by a straight line. In addition, a precise statement for Y can be taken as soon as X is known. This means: "What is happening to Y in terms of X" (Rohland 2000).

The coefficient correlation was 0.84 which is statistical value in indicator 0.01. Fig. 7 shows these coucequences (the expectation formula for this variable) Distance of throw =static factor variable X S1.

$$(D)=3,957+3.237 * (V_0g)$$

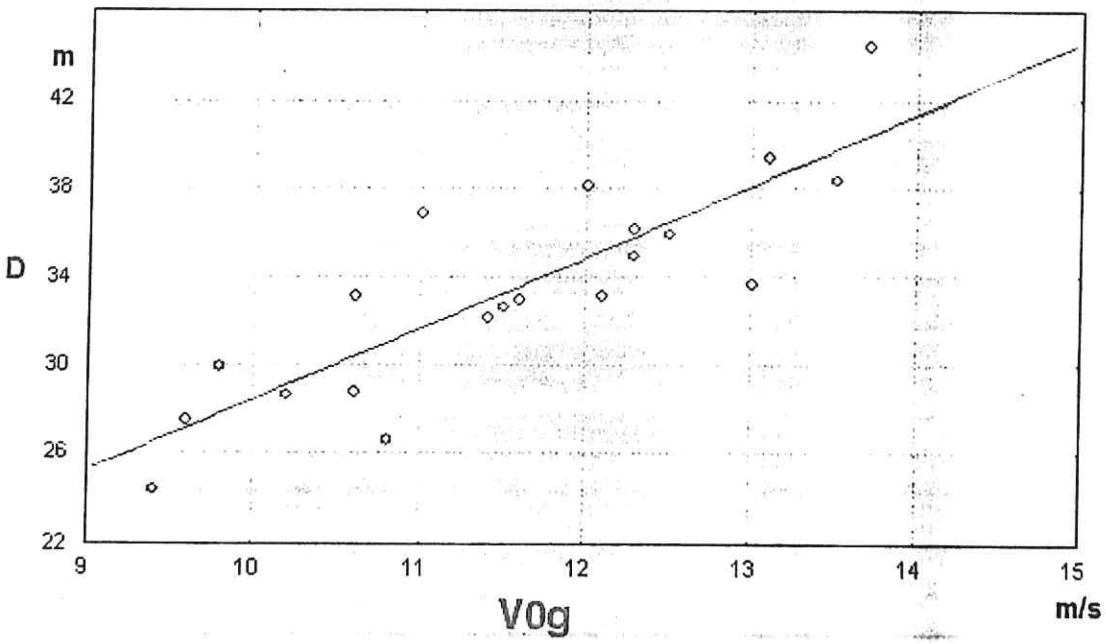


Figure 7: Representation of the connection between the parameters D and V_0g

The Technological Movable System in the javelin throw can measure the maximum velocity, which owns the slide on the rope.

A problem in the area of the javelin throw is the high speed of movement in the ejection phase, the objective feedback from the athlete's own perception of movement very difficult. Usually the athlete receives the feedback about the quality of projectile motion solely on the distance thrown. As for example in warehouses not always necessary space for such throws given, it is for this specific purpose, to develop alternatives that provide at least the dominant primary determinant of throw, the departure rate information.

Bartonitz (1985) and Tunnemann (1995) through their research ,prove that program of mechanical training have an positive influence on the physical abilities and it could use as special way to measure mechanical and physics of performance.

Results In less than 10sec we could predict of the distance performance throw expectation formula.

$(D)=3,957+3.2366*(V_0g)$ which is better than manopolating through video analysis or movie camera in addition to highly coast of training halls, trainers, training programs and other things .Also this device is movable ,easy to carry and store and do not need large space.

The results, which the coaches immediately after the test are available, this can have a positive impact on the performance of athletes wide.

Here, the use of quick information when measuring training so far proved to be particularly successful, as reflected in various scientific works (Freyer, 1992; Fricke et al.; Knoll, 1995; Daugs 2000) confirmed is. This is the Quick-understand after Thorhauer (1971), as an "objective" additional information that can be obtained by using technical measuring equipment.

SUGGESTIONS:

1. Using this new system to pridect the distance performance for Javelin throwers.
2. Using this system to test some mechanical variables in sport events specially those which are from repeted movement type.
3. using this system to test and evaluate learning and training programs.

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USING A TECHNOLOGICAL (PC and Laser) MOVABLE SYSTEM TO PROVIDE IMMEDIATE INFORMATION TO PREDICT JAVELIN THROW DISTANCE [1]

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ABSTRACT:

Sport has become in all fields very close to use of information technology (IT). The use of the PC and highly sophisticated devices in Learning and evaluating training Process is very common in modern Sport sciences. The objective of this research is use an new movable technological system to predict the Javelin throw distance in very sort time. Have been using a movable system for analysis of the pace of the javelin, which consisted of a 800g sledge to be accelerated along a rope and a Laser measure unit. Maximum velocity of a simulated javelin throw movements can be provided immediately as feedback information. Research sample were 20 male sport Students, each one has three attempts. By using of D= -3,957 + 3.2366 X (V0g) formula, the output results take only 10 seconds to shows the predict results. The research recommend to use the movable technological device in indoor and outdoor and use the immediate results as an assessment of the performance or as teaching and learning the technical of the Javelin throw event.

• [1] **Key Words:** Information Technology, Javelin Throw, Biomechanics

ملخص البحث باللغة العربية

أصبحت الرياضة بكافة مجالاتها ترتبط ارتباطا وثيقا باستخدام التكنولوجيا، وإن استخدام الكمبيوتر مع أجهزة القياس الحديثة أصبح اليوم من وسائط التعليم والتدريب في كثير من المجالات الرياضية والتي بواسطتها تساعد في عملية التقويم والتنبؤ بصورة مباشرة وموضوعية. لذا هدف البحث إلى التعرف على دور التكنولوجيا الرقمية للمعلومات السريعة لسرعة انطلاق الرمح فى التنبؤ بمسافة الرمي. وقد تم استخدام نظام ميكانيكي متنقل لتحليل سرعة انطلاق الرمح، والذي يتألف من رمح هيكلي مجـــوف (g ٨٠٠) ويتسارع على سلك معدني، ويستخدم الليزر لقياس أقصى سرعة لرمي الرمح بمحاكاة الحركات ويمكن أن تقدم على الفور معلومات عن التغذية المرتدة. وقد أجرت عينة البحث وعددهم ٢٠ رياضي ثلاث محاولات في الميدان وأخرى على نظام المعلومات السريعة وتم اختيار أفضل محاولة للتوصل إلى العلاقة الدالة الايجابية بين قياس سرعة انطلاق الرمح باستخدام نظام المعلومات السريعة وبين المستوى الرقمي والذي يمكن التنبؤ بالمستوى الرقمي بدلالة سرعة انطلاق الرمح باستخدام نظام المعلومات السريعة والذي يمكن الحصول عليه في زمن أقل من ١٠ث من خلال معادلة التنبؤ. وأوصى الباحث باستخدام نظام المعلومات السريع في التنبؤ بالمستوى الرقمي لمتسابقي رمى الرمح.