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The relationship of some physical components and anthropometric measurements and the extent of their contribution to the performance of the triple jump competition.

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Abstract:

This study aimed to identify the relationship of some physical components (speed, explosive Strength of the legs' muscles and power of the legs' muscles) and anthropometric measurements (weight, total height, length of the lower limb) and the extent of their contribution to the performance of the triple jump competition, the researcher used the descriptive approach, the study was conducted on a sample of (70) students from Students enrolled in the subject of field and track competitions at the department of physical education and sports in Kuwait during the first semester (autumn semester) for the academic year (2023/2024), and were selected in a deliberate way, the SPSS program was used to process the data statistically by calculating: arithmetic mean, standard deviation, median, torsion coefficient, Pearson's correlation coefficient, test "T", Multiple Regression, results showed a statistically significant relationship between Physical components and the performance of the triple jump competition. recommendations was attention to the development of power and explosive strength due to their role in the field of education and training of triple jumpers, considering body measurements as a basis for practicing the triple jump competition, conducting similar research and studies to prepare proposed programs that develop special physical characteristics that will improve performance, attention to teach the correct technique of the triple jump as it is one of the difficult events that need physical capabilities and high technical and harmonic abilities.

Keywords: (physical components, anthropometric measurements, triple jump)

Introduction and research problem:

Scientific progress in the field of physical education in general and athletics sports in particular is one of the most important basic factors for achieving the highest digital levels of the technical aspects of each competition, athletics is one of the basic competitive sports that occupies a special place among other sports as it requires high physical capabilities, and is the basic base for excellence in the performance of many other sports, athletics is one of the basic events that are taught and practiced in the faculties of physical education and sports, so the courses and curricula in Arab universities must include learning the initial principles of each competition and the method of correct performance while identifying the mathematical terms of those competitions and this requires mutual effort between the student and the teacher, taking into account that students have different levels, some of them have knowledge and relationship with athletics and others are beginners, therefore individuals must be provided with the principles, experiences and knowledge of this sport through curricula, as it contributes to the development of applicants to study in faculties of physical education. (Kamal Jamil, 2001).

The development in the record numbers witnessed by athletics in the past years through the investment of the technical and physical capabilities of the players by relying on various sciences in the sports field and applying them correctly through the correct organization of various training methods based on modern scientific methods in training, which leads to achieving the highest levels and

improving the level of achievement and this is the primary goal of every player and coach. (Hussain Mardan, 2009) Athletics events are considered one of the important and fun events that attract the attention of many, especially in local and international sports festivals, so it requires the athlete to achieve a high level of physical readiness, technique, will and determination to win, and triple jump competitions in athletics depend in their kinetic performance to achieve the highest digital levels on the physical components and the degree of integration between them, especially speed and muscle strength as a component Basic depends on the rest of the other qualities, and anthropometric measurements are important in the practice of these events and each practitioner is unique with special physical dimensions that distinguish him from others, because they play an important role in the success of the student's motor performance, so we find that the coach bases his choice of any sports event on the appropriate physical and anthropometric character, for achieving a better level with economy in time and effort, the player cannot achieve any success unless he is strong in structure and has a general physique and physical qualities specific to the effectiveness he exercises. (Mohamed Sobhi, 2003)

The triple jump competition is among of the athletics competitions included in the modern Olympic Games, and its achievements are characterized by continuous development, the most important reasons for the development of the achievement level of this competition is the development of the methods of training used and varied, the use of modern training devices, tools and equipment for competitions to develop the elements of public and private fitness, in addition to the capabilities, facilities, clothes and shoes of athletes. Also, the development of methods and analysis of performance levels, the triple jump competition has received great attention, which helped to find the most principal factors that care of and focused on raising the level of achievement for the better. (Bridgett et al, 2002) (Kamal Jamil, 2001).

Also, the main burden in the performance of the triple jump falls on the muscle group of the lower limb of the player, and therefore must have high physical qualities, the most important of which is strength and speed, the element of strength and speed is one of the important composite elements that should be characterized by the jumper, as it helps him to gain the required speed through approach, which qualifies him to takeoff, and the jumper's dependence on speed only It does not make progress, but must use strength in addition to speed, which is called the power, which plays an important role in the processes of takeoff (hop, step and jump) in the triple jump. (Guthrie, M., 2003), and (Mohamed Jassim, 2005) indicates that the explosive strength and the power is a kinetic characteristic consisting of strength and speed and has an important impact on the achievement of the triple jump distance as it enables the jumper to maintain his speed gained through the approach process.

Through the researcher's experience in the field of teaching and training athletics and through the field follow-up of its championships at the local level for universities and schools, which are held every year on the playgrounds of the department of physical education and sports at the college of basic education in Kuwait, he noticed the small number of players participating and practicing this competition due to the difficulty of its performance, and its need for physical abilities and special anthropometric measurements, it also one of the events that are characterized by a complex skill performance consists of several phases as: approach, hop and step, It also needs a strong takeoff, long flight, and then landing, the researcher also noted that there is a large variation in anthropometric measurements as well as variation in the level of physical components, knowing that the method of selection Players rely on specific physical and skill tests, and this is not enough, as they must also rely on anthropometric measurements for their direct relationship to physical components on the one hand and readiness to develop the level through practice and training on the other hand, hence the researcher saw the need to conduct this study in order to identify the relationship of some physical components (speed, explosive Strength of the legs' muscles and power of the legs' muscles) and anthropometric measurements (weight, total height, length of the lower limb) and the extent of their contribution to the performance of the triple jump competition for students of the department of physical education and sports in Kuwait.

Research Objectives:

This research aims to identify:

- 1. The correlation between some physical components (speed, explosive strength of the muscles of the legs, power of the legs' muscles) and anthropometric measurements (weight, total height, length of the lower limb) and the performance of the triple jump competition among students of the department of physical education and sports in Kuwait.
- 2. The extent to which some physical components (speed, explosive strength of the muscles of the legs, power of the legs' muscles) and anthropometric measurements (weight, total height, length of the lower limb) contribute to the performance of the triple jump competition among students of the department of physical education and sports in Kuwait.

Research Questions:

- 1. Is there a statistically significant correlation between some physical components (speed, explosive strength of the muscles of the legs, power of the legs' muscles) and anthropometric measurements (weight, total height, length of the lower limb) and the performance of the triple jump competition among students of the department of physical education and sports in Kuwait?
- 2. What is the contribution of some physical components (speed, explosive Strength of the legs' muscles, power of the legs' muscles) and anthropometric measurements (weight, total height, length of the lower limb) contribute to the performance of the triple jump competition among students of the department of physical education and sports in Kuwait?

Research terms:

speed: It is the ability to perform repetitive and similar movements to cover a certain distance and in any direction in the shortest possible time. (Mohamed Sabri, 2010)

Muscular strength: It is the ability of a muscle to overcome the maximum possible external resistance or to counter these resistances during performance. (Abdullah Hussein, 2010)

Explosive strength: It is the ability to produce maximum muscle forces once and in the shortest period. (Maan Abdul Karim, 2007)

Power (Speed Strength): It is the ability of a muscle or muscle group to reach the highest frequency in the shortest possible time. (Maan Abdul Karim, 2007)

Anthropometric measurements: It is one of the direct measurements and is the science that studies measurements of the human body and its parts and shows the structural differences in it. (Mohamed Allawi, Nasr El-Din Radwan, 2001)

Research Methodology

Research Curriculum: The researcher used the descriptive approach to its suitability.

Research Community: The study population consisted of students enrolled in the field and track competitions at the department of physical education and sports at the College of Basic Education in Kuwait during the first semester (autumn semester) for the academic year (2023/2024).

Research sample: The sample consisted of the best (70) students who were deliberately selected from the students who performed the triple jump competition and obtained a high numerical level in the jump distance, through the final

practical tests of the first semester (autumn semester) for the year (2023/2024), Table (1) shows the arithmetic mean, standard deviation, median, and torsion coefficient variables of the members of the research sample.

Table (1)				
Arithmetic mean, standard deviation, median a	nd torsion coefficient			
of the variables under consideration	(N=70)			

N	Variables	Unit	Mean	Standard Deviation	Median	Skewness
1	Age	year	21.40	1.12	20.50	2.410
2	Weight	Kg	69.80	0.88	70.00	-0.681
3	Overall Length	Ст	173	2.16	172.60	0.555
4	Leg length (lower limb length)	Cm	73.00	0.91	72.80	0.659

Devices and tools used in data collection:

- A medical device to measure weight and height.
- Stopwatch, Tape measure, Triple Jump Field.
- Digital level registration form, test results and measurements. Appendix (3)

Physical tests and anthropometric measurements:

The researcher adopted the selection and application of physical tests for the physical components and anthropometric measurements used in the study by reviewing some scientific sources and references: (Lamia Hassan, 2011), (Ahmed Ibrahim, Muhannad Hussein, 2005), (Ali Salloum, 2004), (Laila Al-Sayed, 2001), (Mohamed Hassan, 2000), and the measurement of the triple jump distance of the sample members was carried out based on the international law of the Arab Amateur Athletics Federation by a tripartite committee of professors of the department. Appendix (2).

Tests used in the measurement of physical components: Appendix (1)

speed: test of the speed for distance (50 meters) from flying starting position.

Explosive Strength of the legs' muscles: the long jump test from stability.

Power of the legs' muscles: Five-step hop test for the right and left leg.

Anthropometric measurements: Anthropometric measurements were taken by relying on the measurements mentioned in the references and agreed by (Mohamed

Subhi, 2003), (Mohamed Hassan and Mohamed Nasr, 2000), (Ahmed Mohamed and Ali Fahmi, 1996).

Body weight: Weight measured by using a medical scale. **Total length measurement:** Length measured using a ractemeter

Measurement of the length of the lower limb (leg): The length of the lower limb measured using a tape measure from the large trochanter of the upper head of the hip joint to the floor.

Statistical Methods

The researcher used the following statistical methods: arithmetic mean, standard deviation, median, torsion coefficient, Pearson' s correlation coefficient, T test, Multiple Regression.

Presentation and discussion of results:

1- Presenting and discussing the results of the first question, which states: Is there a correlation between some physical components (speed, explosive Strength of the legs' muscles, power of the legs' muscles) and anthropometric measurements (weight, total height, length of the lower limb) and the performance of the triple jump competition among students of the department of physical education and sports in Kuwait?

To answer this question, Table (2) shows the arithmetic mean, standard deviation, median, torsion coefficient for some physical components, anthropometric measurements and the performance of the triple jump competition.

	of physical components and triple jump competition. $N = 70$						
N	Variables	Unit	Mean	Standard Deviation	Median	Skewness	
1	speed	second	7.20	0.65	7.00	0.923	
2	Explosive Strength of the legs' muscles	meter	2.35	0.30	2.20	1.500	
3	Power of the right leg	meter	10.60	2.45	10.50	0.122	
4	Power of the left leg	meter	10.55	2.30	10.40	0.195	
5	Triple jump distance	meter	9.30	1.10	9.25	0.136	

Table (2)

Arithmetic mean, standard deviation, median, torsion coefficient

of physical components and triple jump competition. N = 70

Meshal Fahad Mohamed Althuwaini

Correlation coefficients between some physical components (speed, explosive Strength of the legs' muscles and power of the legs' muscles) and some anthropometric measurements (weight, total length, lower limb length) and the performance of the triple jump competition, and Table (3) shows this.

	Variables	Unit	Triple jump		
N			Pearson correlation	P-value	
1	speed (50 meters)	second	0.336	*0.00445	
2	Explosive Strength of the legs' muscles (Jump from stability)	meter	0.516	*0.00001	
3	Power of the right leg (Hop five steps)	meter	0.602	*0.00001	
4	power of the left leg (Hop five steps)	meter	0.487	*0.00001	
5	Overall Length	Cm	0.155	0.20011	
6	Lower limb length	Cm	0.395	*0.00071	
7	Weight	Kg	0.577	*0.00001	

Table (3)
Correlation coefficients of physical components and anthropometric measurements
on the triple jump competition

Table (3) shows that: The correlation coefficient between the speed test (50 m/s) and the performance of the triple jump competition was (0.336) and statistically significant (0.0044), the correlation coefficient between the explosive Strength of the legs (jump test of stability) and the performance of the triple jump competition amounted to (0.516) and statistically significant (0.0001), the correlation coefficient between power (test of distance five hops with the right leg) and the performance of the triple jump competition reached (0.602) and statistically significant (0.0001), the correlation coefficient between power (test of distance five hops with the right leg) and the performance of the triple jump competition reached (0.487) and statistically significant (0.0001), the correlation coefficient between the total length and the performance of the triple jump competition reached (0.155) and statistically significant (0.2001), the correlation coefficient between legs length (the length of the lower limb) and the performance of the triple jump competition was (0.395) and statistically significant (0.0007), and the correlation coefficient between the weight and the performance of the triple jump competition reached (0.577) and statistically significant (0.0001), which indicates a strong correlation between them among the members of the study sample.

The researcher attributes this result to the fact that the triple jump competition is one of the events that depends heavily on the muscular strength of the two men, especially power and explosive Strength in all its technical phases, as well as because it needs the player to maintain his speed to produce his maximum strength to be able to perform the takeoff phase for each of the hop, step, and jump, Therefore, the player must perform the speed of the approach phase as much as possible to be able to link it to his maximum strength of takeoff to contribute to increasing the horizontal distance during his performance of the triple jump competition, as the ability to rise is one of the strong and necessary qualities that the triple jumper needs, so he must develop the strength of the muscles of his legs because these muscles need a great ability to Endurance performance of the jump phases, as well as the player needs great strength for the muscles that contribute to extent the hip joint, foot joint, strength of the lumbar muscles of the spine and core muscles necessary for the triple jump competition.

(Sidqi Ahmed, 2014) confirms that strength and force of jump are important qualities of sprint and jumping competitions due to the player need to takeoff once or more in some competitions, also (Guthrie, M., 2003) say that the triple jump player must be characterized by special physical

qualities, including speed and strength, as these two elements are linked together and the player cannot achieve any achievement by relying on one element without the other, Therefore, speed must be associated with force, as the horizontal velocity gained through the approach phase is associated with the force that contributes to increasing the player's push force and rising to the highest possible distance, Where the horizontal speed turns into a vertical speed and thus increases the performance distance in the triple jump, the results of this study are consistent with the results of the study of (Walid Ahmed, 2005), (Mohamed Jassim, 2005) in that one of the most important physical qualities necessary that contribute to the achievement of the long jump distance and jumping competitions for players is the speed and power and explosive Strength of the legs' muscles.

The researcher also attributed the existence of an inverse relationship between weight and the level of digital performance of the triple jump competition, considering that weight is one of the important physical characteristics for practicing sports activities, and that weight gain is an obstacle to any sports performance and that the less weight, the greater the ability to move, and that the increase in weight leads to a weakness in the ability on movement and

thus weight becomes an obstacle to athletic performance, and since the increase in body weight and mass requires individuals to exert greater force and effort to overcome gravity, and it must be noted that the relationship between the force of gravity and weight is a direct relationship, which negatively affects the momentum and takeoff and thus increase the individual's ability to perform better, and this is confirmed by (Harre, D, 1982).

2- Presentation and discussion of the results of the second question, which states: What is the contribution of some physical components (speed, explosive Strength

of the legs' muscles, power of the legs' muscles) and anthropometric measurements (weight, total height, length of the lower limb) contribute to the performance of the triple jump competition among students of the department of physical education and sports in Kuwait? To answer this question, simple regression analysis used to reveal the percentage of the contribution of certain physical components and anthropometric measurements in the performance of the triple jump competition for the study sample, and Table (4) shows this.

Simple regression analysis to detect the contribution ratio of physical components and anthropometric measurements of the triple jump competition. $N=70$					
Variables	R	R ²	В	Т	P-value
eed (50 meters)	0.336	0.11	0.568	2.10	*0.03933
plosive Strength of the legs' muscles: (ump from stability)	0.516	0.26	1.892	3.65	*0.00050
ower of the right leg Iop five steps)	0.602	0.36	0.270	4.50	*0.00003

0.487

0.155

0.395

0.577

0.24

0.02

0.16

0.33

0.233

0.079

0.477

0.721

3.40

0.95

2.18

2.50

*0.00112

0.34538

*0.03262

*0.01476

Table (4)	
Simple regression analysis to detect the contribution ratio of physical con-	mponents
and anthropometric measurements of the triple jump competition.	N= 70

Table (4) shows that: the T-value of the speed variable (test 50 m/s) was (2.10) and statistically significant (0.0393), the value of R was (0.336), and the value of R2 (0.11), the value of T for the explosive Strength variable of the legs test (jump from stability) was (3.65) and statistically significant (0.0005), and the value of R (0.516), and the value of R2 (0.26), the value of T for the force variable marked by speed test (distance of five hops with the right leg) was (4.50) and statistically significant (0.0000), the value of R was (0.602), and the value of R2 (0.36), the value of T for the force variable marked by speed test (distance of five hops with the left leg) was (3.40) and statistically significant (0.0011), the value of R was (0.487), and the value of R2 (0.24), the value of T for the total length variable was (0.95) and statistically significant (0.3453), the value of R was (0.155), and the value of R2 was (0.02), the T-value of the leg's height variable (lower limb length) was (2.18) and statistically significant (0.0326), the value of R was (0.395), and the value of R2 (0.16), the weight variable T-value was (2.50) and statistically significant (0.0147), the value of R was (0.577), and the value of R2 was (0.33), which represents the ratio of the effect of variance in the dependent variable resulting from the variance in the independent variable.

Table (5) The results of applying the regression equation to study the percentage of the contribution of physical components and anthropometric measurements to the performance of the triple jump competition in descending order. N- 70

of the triple jump competition in descending order.						
N	Variables	R^2	В	Т	P-value	
1	Power of the right leg	0.36	0.270	4.50	*0.00003	
2	Weight	0.33	0.721	2.50	*0.01476	
3	Power of the left leg	0.24	0.233	3.40	*0.00112	
4	Explosive Strength of the legs' muscles	0.26	1.892	3.65	*0.00050	
5	Lower limb length	0.16	0.477	2.18	*0.03262	
6	Speed	0.11	0.568	2.10	*0.03933	

Table (5) shows that: the highest percentage of contribution to the performance of the triple jump competition is the power of the right legs' muscles, which amounted to (0.36), weight in second place and constitutes (0.33), the power of left legs' muscles in third place and constitutes a percentage of (0.24), explosive Strength of the legs' muscles in fourth place It constitutes (0.26), the fifth place was the length of the lower limb (0.16), and in the last place was the speed (0.11), and it is clear that it is statistically significant at the level of (0.05).

3

4

power of the left leg

Lower limb length

(Hop five steps) **Overall Length**

Weight

(Ahmed Lotfi, 2008) explains that strength is one of the basic physical components to accomplish the jump distance and obtain horizontal distances effectively, and that its use is an effective factor in long and triple jump competitions, whose performance requires work to integrate the maximum strength of the muscles with the maximum speed of performance to achieve a high degree of power, especially if functional strength is one of the qualities required to be developed for the success of performance.

The researcher believes that this result is logical and reasonable in the arrangement of these elements due to the fact that the triple jump competition is one of the events that need physical elements, especially power of the legs' muscles, which contains the elements of strength and speed linked together, because the successive technical phases of the triple jump competition (hop, step, jump) need a high approach speed and great muscular strength to perform takeoff phase To reach an advanced performance and achievement, and also followed in the order of explosive Strength of the legs' muscles because the goal of this trait is to overcome body weight at full speed.

(Khater and Al-Beik, 1996) states that anthropometric measurements have a great role in superiority in the sports field because the fitness of the individual is determined and the appropriateness of the composition of his body for the specific activity, and that the practice of any sports activity requires physical and physical characteristics there are games that require speed and games that require height and others that require strength.

This was confirmed by (Wilson, et al., 2009), (Birch, et al., 2005) in the importance of power and explosive Strength when training triple jumpers for its high contribution to the progress of the level of achievement, followed by the weight element in the ranking, as the more the body weight is appropriate, it gives momentum to the individual to help him jump better, unlike fat bodies, and the appropriate and less weight body is less exposed to gravity as it can be resisted and perform the jump. (Harre, D, 1982) confirmed that mobility reduced with weight gain as body weight plays a vital role in sports

Conclusions:

Through the results of the study can extracted the following Conclusions:

- Speed is one of the important qualities that must characterized by the triple jumper player, as it requires the performance of the jumper to sprint very quickly during the approach to gain a horizontal starting speed, which leads to an increase in the distance of the jumper.
- Explosive Strength and power are effective aspects of muscular strength and one of the basic physical components on which to achieve an elevated level of performance in jumping competitions depends.
- The muscular strength of the legs in the triple jump competition plays a major role in the speed of the player and that there is a statistically significant relationship between the explosive Strength of the legs and the performance of the jump competition, as the greater the muscle strength, the greater the jump distance better.
- Students of the faculties of physical education are an effective element that provides sports teams with the best players in various sports, especially individual competitive sports, as it is possible for a student to start playing a certain game at a later age, and this makes the university student in the rule of a junior player who can actually start practicing this competition for the first time at the university.

Anthropometric measurements are considered one of the necessary and important specifications that must be characterized by the triple jumper in athletics, as he must be characterized by special physical dimensions that distinguish him from others, because they play an important role in the success of the player's motor performance, so we find that the coach bases his choice of any sports event on the appropriate physical and anthropometric measurements for that event and in a way that ensures progress to achieve a better level with economy in time and effort.

Continuous interest in developing various physical qualities, as they have a positive impact on the level of skill performance.

Recommendations:

Considering the findings of the study, it recommended that:

- Attention to the development of power and explosive Strength due to their role in the field of education and training of triple jumpers to improve the level of achievement for the better.
- Considering body measurements as a basis for practicing the triple jump competition
- Work on conducting similar research and studies to prepare proposed programs that develop special physical characteristics that will improve performance and reveal other results to serve scientific research.

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