

The Relationship of body mass index (BMI) to some types of special strength, flexibility, and the level of digital performance of throwing and jumping activities for students of athletics courses

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Abstract

This Study Aimed at identifying the relationship of the body mass index (BMI) to some types of special strength and flexibility of the back and shoulders muscles, the transition velocity and the digital level of throwing and jumping activities among students of athletics courses, the study used the descriptive approach on a sample of (52) students. Athletics courses, where (22) students practiced throwing activities, and (30) students practiced the activities of the jump. The results showed a strong statistically significant correlation of body mass index and elasticity of the back muscles, and a moderate correlation of the explosive force distinguished by the velocity of transition among the sample members, the Results also showed a strong correlation for muscle size and the digital level of the effectiveness of the shot, the presence of a non-significant intermediate relationship for the body mass index, types of strength, flexibility of the back muscles and the digital level of throwing activities, in addition to a strong statistically significant correlation of the transition velocity and the digital level of the triple jump. As well as the existence of a medium correlation relationship for the types of strength, flexibility and the digital level of jump events, the researchers recommends the necessity of Ella BMI to conduct research and similar studies to prepare proposed programs that work on introducing the importance of BMI in the sports field and its relationship with various individual and team sports in order to serve scientific research.

Key words: Body Mass Index (BMI), strength types, flexibility, throwing and jumping activities.

Introduction

BMI is one of the important measurements in many fields, such as studies of growth, obesity, general health and physical performance. At the same time, it is an easy-to-apply and highly stable equation that does not require costly means.

The researchers address the extent of BMIs' impact on the level of physical fitness and sports practice, whether it affects positively or negatively on those elements and sports, the concept of body mass index is relative to the Belgian mathematician Edwin Colten, which is the result of dividing body weight in kilograms by the square of height in meters, which is the

internationally recognized measurement to distinguish overweight from obesity and ideal weight from thinness, it expresses the relationship between a person's weight and height.

BMI has been recognized by the US National Institute for World Health as the best standard for measuring obesity, and BMI is one of the modern and accurate measures in the classification of weight (Al-Hasanat,2008).

Physical, kinetic abilities and physical measurements are among the basic and intrinsic factors for the requirements of sports performance, scientists and researchers have agreed that every sports activity has its own

physical requirements to reach the competitive level, in this regard, many studies and references have shown the great importance of identifying the variables of structural growth, which they are represented in height, weight, body structure and composition, body surface area, and body mass index, which are considered as contributing and determining variables to physical and motor performance.

Physical characteristics predict performance to the same degree as physical and physiological characteristics; this is due to the overlap of factors or Variables in their impact on performance ability.

Physical attributes such as strength, speed and flexibility are considered among the basic physical attributes that make up performance and that can affect it directly (Fraud et al,2007).

Athletics is one of the main competitive sports that occupies a special place among other sports; because it requires high physical and motor capabilities, it is considered the basic rule for excellence in the performance of many other sports.

Therefore, this sport requires a high level of physical, technical preparation, willing and determination to win; because it includes various types of motor skills related to the elements of physical fitness such as speed, agility, flexibility, endurance, strength...etc, and that athletics is a competitive physical activity that consists of several separate competitions based on the natural movements of humans.

In its competitions, athletics branched into basic branches such as jumping, throwing, walking, and running of all kinds (Al-Rabadi,2001).

Throwing and jumping activities depend on their motor performance to achieve the highest digital levels on the physical attributes and the degree of integration between them, in particular muscular strength as a basic characteristic on which the rest of the other attributes depend.

Explosive force and speed-distinguished force is considered one of the effective aspects of muscular strength, and muscular strength and speed are among the basic and important physical attributes on which achievement depends, especially throwing and jumping competitions.

Depends on the starting speed of the tool, this can only be done by the availability of high muscular strength that emerges through the explosive force of the arms and legs, this is what was indicated by (Harra,1971) and (Millive,1998) in regards to the importance of muscular strength when Performance of motor skills and technical performance of events, and that athletes need muscle strength regardless of their activities, and that individuals who are characterized by strength can Achieving a better athletic level.

BMI has its importance in practicing these activities, as each practitioner has special physical dimensions that distinguish him from others, because they play an important role in the success of the motor performance of the thrower or jumper in a way that ensures progress to achieve a better level with the economy in time and effort (Hassanin,2003).

Therefore, it is required from the players a tremendous effort. The player must have a high level skill performance and he must have these qualities.

Statement of purpose

The continuous competition to break records and achieve the highest levels of achievement in athletics competitions in general, throwing and jumping events in particular, is one of the topics that still occupy the minds of the majority of those interested in achieving the digital development of these events at various levels. From academic institutions and faculties of physical education, and through their follow-up to athletics championships at the university and local levels, they noticed that the level of digital achievement for these events is still modest for players compared to the Arab and Olympic levels, so they need to be developed.

The researchers also noted, and through their review of literary studies, that there are some studies focused on the subject of body mass index and its relationship to some sports activities, where BMI is one of the important measurements in many sports fields and physical abilities, and important values and indicative of the level of athletic performance, and it is mentioned The research that was conducted mainly on the athletes of throwing and jumping events in athletics are among the

trained and practicing athletes, and the majority are high-level athletes, but in the field of this study, the researchers decided to conduct it on novice students practicing throwing and jumping activities through the study of athletics courses in the College of Physical Education and did not. They have practiced it before, with the aim of identifying the relationship of the body mass index with some types of physical strength and abilities (explosive force and speed characteristic of the muscles of the arms and legs, flexibility, and transitional speed) and the digital level of throwing and jumping competitions for beginners, and does this relationship positively or negatively affect the physical elements and level of digital performance of throwing and jumping events, so it is important that the novice students realize the importance of their body mass index, in order to avoid being thin or overweight, and whether they can meet the requirements of throwing or jumping competitions. Therefore, attention must be paid to everything related to the conditions of competitions for athletics events that the player goes through during the competition.

Importance of the study

The importance of this study derived from providing information that may allow giving results that will help coaches to choose the best elements during the selection process for the novice players, according to the results that will obtain, in addition to the determinants of physical and abilities that will be determined, and they consider the students of the faculties of physical education an effective element that provides good sports teams. Players in various sports, especially individual competitive sports, as it is possible for a student to start playing a particular game at a later age, this makes the university student in the judgment of the emerging novice player who can actually start practicing this competition for the first time at the university.

The importance of the current study is as follows:

- Identifying the relationship of body mass index with some types of muscle strength and flexibility and the level of digital performance of throwing and jumping activities

for students of the College of Physical Education and players, and reaching high degrees of mastery and achievement in this event.

- Directing the results of the study for students of physical education faculties to deal with them in the field of teaching and training in particular, since throwing and jumping activities are among the basic activities that are taught, learned and practiced for different educational levels and age groups.

Objectives of the study

This study aimed at:

- Identifying the relationship of the body mass index (BMI) to some types of special strength (explosive force of the muscles of the arms and legs, speed characteristic, grip strength, flexibility of the back and shoulder muscles, muscle size, and transitional speed) among students of athletics courses.

- Identifying the relationship of the body mass index (BMI) and some types of special strength, flexibility of the back and shoulder muscles, muscle size, and transitional speed) with the level of digital performance of throwing activities (shot put, javelin throw) and jump (triple jump, high jump) among students of games courses.

Questions of the study:

- Is there a statistically significant correlation between BMI and some types of special strength (the explosive force of the muscles of the arms and legs, the speed characteristic of the muscles of the arms and legs, grip strength, flexibility of the back and shoulders muscles, muscle size, transitional speed) among students of game courses?

- Is there a statistically significant correlation with the body mass index and some types of special strength and flexibility of the back and shoulder muscles, muscle size, transitional speed and the level of digital performance of throwing activities (jet shot, javelin throw) and jump (triple, high jump) among students of games courses powers?

Concepts of the study

A number of specialists and researchers dealt with the concepts of study terms within their studies, these terms are:

- **Body Mass Index (BMI):** a mathematical formula for determining the normal weight of a person, which is the product of dividing body mass by the square of height ($\text{mass}/\text{height}^2$, kg/m^2 , kg/m^2).
- **Special strength:** the strengthening that particularly affects the muscles participating in a kind of play, it is the special strength, which is the strengthening of some muscles that are necessary for the requirements of the game, especially the muscles of the legs. (Al-Baik, 2003).

Literature review

By reviewing the theoretical literature and previous studies, the researchers found that there are many similar studies related to the subject of the study for some athletics activities. In line with the objectives of this study, the researchers present some of these studies:

Araar et al (2018) conducted a study aimed at identifying the relationship of body mass index to some physical traits and motor abilities among undergraduate students at the Institute of Science and Technology of Physical and Sports Activities, on a sample of (20) students, where the researchers relied on the descriptive approach By the correlative method and using the (SPSS) program, the results of the study showed that there is a weak and non-statistically significant inverse correlation between BMI, static balance and explosive power among female students, as well as a weak and non-significant direct correlation between BMI and agility among female students. There is a weak, positive, statistically significant correlation between body mass index and kinetic speed among female students.

Hamid (2017) also conducted a study aimed at identifying the relationship of some anthropometric and physical measurements to the digital level of the effectiveness of javelin throwing among students of the Faculty of Physical Education at Palestine Technical University, in addition to identifying the most mundane and physical measurements that contribute to the digital level of the effectiveness of javelin throwing. The sample consisted of

(38) students who were chosen randomly, anthropometric measurements and physical tests were also taken, where the data were analyzed using the SPSS package. Physical characteristics such as maximum speed, speed characteristic of the muscles of the arms and chest, maximum strength of the core muscles, maximum grip strength and numerical achievement for the effectiveness of javelin throwing spear.

Al-Zoubi (2016) conducted a study aimed at identifying the relationship of some physical measurements and physical attributes to the level of digital achievement for the effectiveness of the long jump and shot put in athletics among female students of the Faculty of Physical Education at Yarmouk University. The researcher used the descriptive approach to suit the nature of the study, the sample of the study consisted of (35) student from the Division of Athletics Courses, where some physical measurements and physical tests were conducted in addition to measuring the digital level of the effectiveness of the long jump and the shot put. The results also showed that there is a statistically significant relationship between the total length and weight on the one hand and (the explosive power of the arms) on the other hand, and it was not statistically significant with respect to the length of the lower and upper limb, the results also showed a statistically significant relationship between the explosive power of the legs and the digital level of the long jump and shot put.

Zuvela et al (2011) conducted a study aimed at identifying the relationship of kinetic abilities (explosive force, maximum force, and transitional speed) at the level of digital achievement for the effectiveness of javelin throwing. The study sample consisted of (53) students of the Faculty of Physical Education divided into Two groups, the first consisted of (34) students who did not have sufficient knowledge of the effectiveness of javelin throwing, and the second group of (19) students who had sufficient knowledge of technical performance technique for the effectiveness of javelin throwing, and the results of the study showed that there is a relationship Positive correlation of explosive force, maximum force and transitional speed among students who have knowledge of technical performance technique for the effectiveness of javelin throwing at the digital level and at a high level, while there is no

correlation between motor abilities and transitional speed among students who do not have sufficient knowledge of technical performance technique in the effectiveness of javelin throwing.

Al-Qaddoumi (2003) also conducted a study aimed at identifying the body mass index (BMI) and resting metabolism (RMR), and developing an equation to measure (BMI) and (RMR) for the players of the participating teams in the 20th Arab Volleyball Championship for men in Jordan, to achieve The study was conducted on a sample of 186 players, the data was analyzed by using the statistical package (SPSS). The results showed that the level of (BMI) was good, where the average reached (38.23 kg/m²), the level was good for (RMR) which reached The average was 60.2067 (calories/day), in addition, the best BMI criterion was (7.20 kg/m²), and to RMR (2500 calories/day). An equation was also developed to measure (RMR) in terms of the player's height, considering that height is an essential element for success. In the game and is not affected in the training programs.

This study is distinguished from previous studies in that it is based on the study of the relationship of body mass index with some types of special strength, muscle size and flexibility of the shoulder muscles, as well as the relationship of all these variables to the digital level of throwing and jumping activities for students of athletics courses who are novice in practicing this activity to discover their potential and work on investing and developing it And choosing the

effective element to provide the university sports teams with the experience of players in various sports, especially the individual competitive speed sports, as it is possible for one of the students to start playing a particular game at a later age, and this makes the university student in the judgment of the emerging novice player who can actually start practicing this competition For the first time at the university.

Methodology

The researchers used the descriptive approach for its suitability to the nature of the study.

Population of the study

The study population consisted of all students of athletics courses at the Faculty of Physical Education at Yarmouk University for the first semester of the academic year (2021-2020).

The study sample

The best (52) students from the division of athletics courses in the college were chosen in a deliberate way, where the best distances were taken for (22) students who practiced throwing activities, and the best (30) students who practiced jumping activities, during the examination period for the first semester of the academic year (2020-2021).

Table (1) shows the arithmetic averages, standard deviations, the highest value, the lowest value, and the skewness values for the variables of the study sample.

No.	Variables	measruing unit	Sample N	SMA	standard deviation	skew modulus
1	Age	year	52	21.0769	1.87707	1.475
2	Weight	kg	52	68.9808	8.42380	.557
3	total length	meter	52	1.7560	.06766	.620

Devices and tools used to collect data for the study:

- Medical device for measuring weight and height.
- Stopwatches.

- A registration form for the results of tests and measurements.
- Playgrounds and courses for the Faculty of Physical Education at Yarmouk University.

Physical tests for the types of special strength and physical specifications for the study:

The researchers relied on the selection and application of physical tests related to the types of muscle strength and the legalized and approved transitional speed used in (Al-Diwan,2011); (Al-Bishtawi & Al-Khawaja, 2005):

- Level distances were measured for the shooting and jumping activities of the sample members based on the international law of the Arab Amateur Athletics Federation, International Association of Athletics Federations (2004-2005).
- The distances of the activities of the students of the research sample were measured through the final practical exam for the first semester of the year (2020-2021).

The tests used to measure the types of force related to the shooting and jumping activities

- Explosive power of the muscles of the arms: the test of throwing a medical ball of weight (3 kg) from the shoulder with one hand from a standing position over the head.
- The speed characteristic of the muscles of the arms: the pressure test from the prone position for a period of (30 seconds).
- The explosive power of the muscles of the legs: the long jump test from stability (meters).
- The speed characteristic of the muscles of the legs: the five-step partridge test for the

right leg and the left leg, and recording the average result in meters.

- Grip strength using Jackson's device for a period of (60) seconds and at an elbow angle of (90°) Flexibility of the back and shoulder muscles.
- Transitional speed: a speed test of a distance (50m) from the starting position of the flight.

Body Measurements

- Body weight: The body weight of all students was taken using a medical scale.
- Measuring the total length: a restameter was used to measure the total length.
- Body mass index: It is the result of dividing the body weight in kilograms by the square of the height in metres, which is the internationally recognized measurement to distinguish excess weight from obesity from ideal weight from thinness, and it expresses the relationship between a person's weight and height and is recognized by the US National Institute for World Health as the best Standard for measuring obesity. The BMI is one of the modern and accurate measures in the classification of weights (Al-Hasanat, 2008).

Body mass index (BMI) equation

The equation for calculating BMI is simple because it requires height (in square metres) and weight (in kilograms). Hence, the equation for BMI is: (Mass/Height², kg/m², .kg/m²) Body Mass Index (BMI, Mass/height²,) (Araar et al,2018).

Classification for BMI kg/m²

Table No. (2): Classification of BMI values according to the World Health Organization (WHO).

Classification	BMI kg/m²
Malnutrition	less than 16
Thinness	Between 16.5 and 18.5
Normal	Between 18.5 and 25

Overweight	between 25 and 30
moderate obesity (class 1)	between 30 and 35
high obesity (class 2)	between 35 and 40
Obese or overweight (class 3)	more than 40

Study variables:**Independent variable**

- BMI
- The explosive force of the muscles of the arms and legs
- The speed characteristic of the muscles of the arms and legs
- Fist strength for two arms
- Flexibility
- Muscle size
- Transition speed

Dependent variable:

- Digital performance level for throwing events (shot put, javelin).
- The level of digital performance of the jump events (triple jump, high jump)

Statistical procedures

The appropriate statistics were used to process the data for the study:

- Arithmetic means
- Standard deviation
- skew modulus
- Pearson Correlation

Results view

The results of the first question: Is there a correlation between body mass index and some types of special strength (the explosive force of the muscles of the arms and legs, the speed characteristic of the arms and legs, grip strength, flexibility of the back and shoulders muscles, muscle size, transitional speed) among students of athletics courses?

To answer this question, Table (3) shows the arithmetic averages, standard deviations, and skew values.

Table (3)

Arithmetic averages, standard deviations, and torsion coefficient for BMI, some types of strength, and the numerical level of my activities (shot put and javelin throw).

No.	Variables physical	measuring unit	Sample N	SMA	standard deviation	skew modulus
1	BMI for throwing players	Kg	22	23.4682	2.71318	.636
2	The explosive power of the muscles of the arms	meter	22	14.4182	2.71318	.636
3	The speed characteristic of the muscles of the arms	meter	22	40.8636	13.56921	.368

4	fist strength	Newton	22	57.3182	8.06159	-.364
5	Flexibility of the back and shoulder muscles	repetition	22	33.0455	6.55001	.434
6	Muscle size	cm	22	33.5455	3.05080	.754
7	The digital level of shot put effectiveness	meter	22	9.3250	.72140	.015
8	The digital level of effectiveness of javelin throwing	meter	22	27.8695	2.99169	.347

Table No. (4)

Arithmetic averages, standard deviations, skew coefficient for BMI, some types of strength, flexibility, transitional speed, and the numerical level of the two activities (triple jump, high jump).

No.	Variables physical	measruing unit	Sample N	SMA	standard deviation	skew modulus
1	BMI for jumpers	Kg	30	21.6667	2.88245	.626
2	The explosive power of the muscles of the legs	Meter	30	2.3860	.21910	-.451
3	The speed characteristic of the muscles of the legs	Meter	30	11.4350	.89992	-.330
4	Flexibility of the back and shoulder muscles	repetition	30	15.8667	3.91049	-.023
5	Transmission Speed	M/S	30	7.0223	.34194	-.039
6	The digital level of the triple jump effectiveness	Meter	30	9.8583	.62077	-.568
7	The digital level of high jump effectiveness	Meter	30	1.3867	.08604	.618

Table No. (4) shows the specifications of the study sample, which shows the arithmetic mean, standard deviation, and skew coefficient of the study variables among the sample members, which numbered (52) students.

In order to answer the first question, Table No. (5) shows the correlation of body mass index, some types of muscle strength, and some variables related to throwing and jumping activities.

Table (5): Correlation coefficients of the relationship of BMI with types of strength and some variables (explosive force of the muscles of the arms and legs, speed-characterized force of the muscles of the arms and legs, grip strength, flexibility of the back and shoulders muscles, muscle size, transitional speed) among the study sample for throwing and jumping activities

Variables	The body mass related to the force types indicator for the throwing players		The body mass related to the force types indicator for the jump players	
	Correlation coefficient	Statistical significance	Correlation coefficient	Statistical significance
Explosive force/m	0.100	0.567	0.257	0.170
Speed characteristic force / m	0.210	0.348	0.273	0.144
fist strength	0.030	0.896
Flexibility of the back and shoulders muscles	0.560	** 0.007	0.129	0.495
Muscle size	0.245	0.272
Transmission Speed	0.168	0.374

**** Statistically significant at the level of (0.05)**

Table No. (5) shows the relationship of body mass index with the types of strength and some variables (explosive force of the muscles of the arms, the speed characteristic of the muscles of the arms, the strength of the grip, the flexibility of the back and shoulders muscles, the size of the muscle) for the throwing activities of the study sample.

It appears from table no. (5) that:

- There is a weak correlation between body mass index and explosive strength of the muscles of the arms among the members of the throwing sample, but it is not statistically significant.
- There is a medium correlation relationship to the body mass index and the strength characteristic of the speed of the muscles of the arms and the size of the muscle among the members of the study sample for the

throwing activities, but it is not statistically significant.

- There is no correlation with body mass index and grip strength among the sample members for throwing activities.

- There is a strong statistically significant correlation with the body mass index and the flexibility of the back and shoulder muscles among the sample members for the throwing activities, which amounted to (0.560) and with statistical significance (***)0.007).

Table no. (5) also shows the correlation coefficients of the relationship of BMI with the variables under study among the members of the jump activities sample, there is a medium correlation relationship with BMI, explosive force and speed characteristic of the muscles of the legs among the study sample for jumping activities, but it is not statistically significant, as well as the existence of a correlation relationship Weak for body mass index and flexibility of the

back and shoulder muscles among the sample members, but it is not statistically significant.

To identify the correlation coefficients of the relationship of body mass index and explosive strength of the muscles of the arms and legs, the

speed characteristic of the muscles of the arms and legs, grip strength, flexibility of the back and shoulder muscles, muscle size, and transitional speed (with the digital level of the throwing and jumping activities of the study sample members), shown in table no. (6):

Table (6) Correlation of body mass index and some types of muscle strength and physical variables at the digital level of throwing activities

Variables	Numerical level for shot put efficiency		Numerical level for Javelin throw efficiency	
	Correlation coefficient	Statistical significance	Correlation coefficient	Statistical significance
BMI	0.302	0.172	- 0.108	0.631
Explosive force of the muscles of the arms / m	0.233	0.297	0.104	0.644
The speed characteristic of the muscles of the arms / m	0.350	- 0.111	- 0.166	0.461
fist strength	-0.140	0.534	0.048	0.833
Flexibility of the back and shoulders muscles	0.289	0.179	0.407	0.060
Muscle size	0.414	* 0.052	0.036	0.675

**** Statistically significant at the level of (0.05)**

It appears from Table (6) that:

- There is a medium correlation with the body mass index and the numerical level for the effectiveness of the shot put, and a weak correlation with the effectiveness of javelin throwing among the study sample members, but it is not statistically significant.
- There is a medium correlation for the explosive force variable, the speed characteristic of the arm muscles, the flexibility of the back muscles, and the numerical level for the effectiveness of shot put and throwing, but it is not statistically significant.

- There is a weak correlation for the variable of grip strength of the muscles of the arms and the effectiveness of the shot put, and there is no correlation for the strength of the grip and the effectiveness of javelin throwing among the sample members.

- There is a strong statistically significant correlation for the muscle size variable and the numerical level of the two shot put effectiveness, where the correlation coefficient reached (0.414) and statistical significance (0.052 *).

Table (7): Correlation coefficients for (body mass index, explosive power of the muscles of the legs, speed-characterized strength of the muscles of the legs, flexibility of the core muscles, transitional speed) the numerical level of the activities of the triple jump and the high jump

Variables	Triple jump distance	High jump distance

	Correlation coefficient	Statistical significance	Correlation coefficient	Statistical significance
BMI	- 0.275	0.141	- 0.185	0.327
Explosive force of the muscles of the legs / m	0.228	0.225	0.198	0.294
The speed characteristic of the muscles of the legs / m	0.267	0.154	0.044	0.817
Flexibility of the back and shoulders muscles	0.138	0.469	0.271	0.147
Transmission Speed	0.407	* 0.02	- 0.136	0.473

**** Statistically significant at the level of (0.05)**

It appears from Table (7) that:

- There is a medium correlation with body mass index, explosive strength of the muscles of the legs, speed characteristic of speed, flexibility of the back muscles, and the numerical level of the effectiveness of the triple and high jump among the sample members, but it is not statistically significant.
- There is a strong correlation for the variable speed transition and the numerical level of the effectiveness of the triple jump, where the correlation coefficient (0.407) and statistical significance (*0.02).

Results Discussion

Discussing the results of the first question: Is there a correlation with the body mass index and some types of special strength (explosive force of the muscles of the arms and legs, the speed characteristic of the muscles of the arms and legs, grip strength, flexibility of the back and shoulders muscles, muscle size, and transitional speed) among students of athletics courses?

The results showed through Table No. (5) that there is a strong statistically significant relationship to body mass index and flexibility of the back and shoulder muscles, and there is a non-statistically significant medium relationship to explosive force and speed characteristic of the muscles of the arms and legs, and muscle size to BMI, and there is no correlation with The grip strength of the sample members.

The researchers attribute the existence of a strong correlation between body mass index and

flexibility of the back and shoulder muscles to that the average among the members of the throwing activities sample amounted to (23.4 kg / m²) and the rate was (21.66 kg/m²) among the members of the jumping activities sample, and these two averages came within the normal classification For the body mass index, which ranges between (18.5-25 kg / m²) as indicated by the World Health Organization, that is, there is no increase in weight and the percentage of fat that impedes performance on the degree of flexibility of the body and works to weaken it, and thus as a result of this moderate average of the mass index Body (BMI) helped to provide a modest degree of flexibility and ease of movement of the trunk among the sample members, especially that they are students who do not practice throwing and jumping activities. This result agrees with (Araar et al,2018), (Fraud et al, 2007).

The results also showed that there is an average correlation of BMI with explosive strength and speed characteristic of the muscles of the arms and legs and muscle size for the study sample members, but it is not statistically significant. This is due to the fact that the sample members are beginners students and not advanced players who have a high degree of fitness The physical, which is one of the necessary and important qualities for practicing these activities, and just as the weakness and strength of the upper and lower extremities of the body depends on the weight of the player and the muscle mass of the arms and legs, and that throwing activities are activities that require body weight and muscle mass to increase the strength of the upper limbs to help increase the strength And the speed of

pushing the tool to get a horizontal distance forward, as well as for the ability of the lower limbs, which need muscle mass to contribute to increasing the ability to resist Earth gravity to increase the force of pushing the earth forward to increase the speed and jump distance, whether the horizontal or vertical distance.

In this regard, many studies have shown the great importance of identifying the skeletal growth variables, which are represented in height, weight, body structure and composition, body surface area and body mass index, which are considered as contributing and specific variables to physical and motor performance, and that physical characteristics predict performance to the same degree that The physical and physiological characteristics are based, and this is due to the overlapping of factors or variables in their impact on the ability to perform. Physical characteristics such as strength, speed and flexibility are among the basic physical characteristics that make up the performance of shooting activities, which can affect it directly. This was confirmed by (Agha & Amer, 2010); (Sheppard et al, 2008) that is affected by body mass, muscle viscosity, components, structural and mechanical qualities of the body, upper and lower extremities, joint flexibility, and from a scientific point of view, strength and speed increase with increasing muscle mass.

Accordingly, BMI, muscular strength of all kinds, and flexibility are considered among the most important elements that enable the individual to do most of his work, whether it is sports or his normal daily activities. It is necessary to acquire and develop them, but there are multiple factors that affect the various basic physical characteristics (Sheppard et al, 2008).) and (Fraud, et al, 2007).

Discussing the results related to the second question: Is there a statistically significant relationship between body mass index and some types of special strength (explosive force of the muscles of the arms and legs, strength characteristic of speed, grip strength, flexibility of the back and shoulder muscles, muscle size, transitional speed) and the level of digital performance of throwing activities (shot put, throwing Javelin) and jump (triple jump, high jump) among students of athletics courses?

In terms of throwing activities, the results showed that there is a strong statistically significant correlation for the muscle size variable and the numerical level of the effectiveness of the shot put, and there is no relationship with the numerical level of the effectiveness of javelin throwing, as well as the presence of a medium correlation that is not statistically significant for each of the body mass index, explosive force and distinctive strength The speed of the muscles of the arms and the flexibility of the muscles of the back and shoulders, and the digital level of the throwing activities (the shot put, the javelin throw).

The researchers attribute the existence of a strong statistically significant correlation relationship to the size of the muscle and the numerical level of the effectiveness of the shot put, because the size of the muscle indicates an increase in the cross-section of the arms muscle and then an increase in muscle strength. The arms depend on several factors, including: (the size and number of the muscles involved, the percentage of muscle fibers at work, and the coordination of muscle groups). Increasing the size of the muscles leads to an increase in the strength of the arms, and the researchers believe that this relationship was random, especially that the study sample members are students of junior athletics courses. Those who do not practice throwing activities, and most of these individuals may be practicing muscle strength training and iron training in the clubs that they frequent in their spare time in order to obtain an increase in the size of the muscle mass of the arms, which leads to an increase in the strength of the arms and thus increase the explosive power and strength characterized by speed and the digital level of effectiveness Pushing the shot, and that the increase in muscle size means an increase in the ability and power to push the arms to help increase the strength and speed of the push The tool for the longest forward horizontal distance. This result is consistent with what was indicated in (Archana & Koley, 2020); (Liao, 2016); (Ibegbu et al, 2014) that an increase in muscle size and mass results in greater physical strength, and that increasing muscle size means an increase in muscle size and muscle mass. In the cross section of the humerus muscle, and then an increase in muscle strength, which leads to an increase in the performance distance.

The mean relationship of body mass index (BMI) to the numerical level of the effectiveness of the shot put and the weak relationship to the numerical level of the effectiveness of javelin throwing is also attributed to the non-statistically significant that the average body mass index (BMI) among the study sample members came within the normal rate according to the classification of the World Health Organization, which is equal to (mass Body Mass Index(BMI), Mass/height^2 , kg/m^2 (2 , kg/m^2) It is necessary and important to practice these activities, and just as the weakness and strength of the upper limbs of the body depends on the size of the muscle mass of the muscles of the arms, and the fact that the throwing activities are among the activities that require body weight and muscle mass to increase the strength of the upper limbs to help increase the strength and speed of pushing the tool to obtain a horizontal distance forward. And that there is a relationship between weight, height and body mass index, as they affect the strength of the arms, and this was confirmed by (Hassan & Nassif, 1980) about Sargent when he said, "Muscle strength is affected by weight, height and BMI.

The existence of this weak relationship is attributed to the body mass index and the numerical level of the effectiveness of javelin throwing, it becomes clear when the comparison is made with the weight of other javelin contestants. Among the activities that depend on the great kinetic compatibility that appears in the opposite tension between the shoulder girdle and the hip girdle in the intersection step and preparing for the throwing movement that characterizes the penultimate step and moving from it to the last step, which is the basis of the throwing position.

The results also showed that there is a medium correlation of explosive force and speed characteristic force on the digital level among the members of the throwing sample to a medium degree compared to other types of force, the researchers attribute this to the fact that the explosive force and speed characteristic force are types of muscular strength that are commensurate with the motor performance that requires the contraction of the working muscles for motor performance. And it is one of the important elements on which the throwing competitions depend because of its great importance in the efficiency and raising the level

of performance and among the special physical qualities that play a distinguished role in achieving a high level of achievement for the throwing activities, and muscular strength also has the greatest weight in the sequence of these qualities because the high level in The achievement of the shooting activities depends on the speed of the launch of the tool, and this can only be done by the availability of high muscular strength that emerges through the explosive force and the speed-characterized force of the two arms, which plays a major role in the speed of the tool's flight, and it has been proven beyond any doubt that there is a strong correlation between force and distance To obtain it, the greater the strength of the throwing arm, the greater the distance of the throw, and this was confirmed by (Alawi, 2000) that the nasal force The speed advantage is one of the basic elements needed to develop the level of various events, especially the throwing competitions, and the greater the explosive force of the throwing arm the player has, the greater the ability to push him to the tool and thus increase the speed of its launch and increase the level of digital performance of the event.

The results also showed that there is a medium correlation to the variable of flexibility of the back and shoulders muscles and the digital level among the sample members for the two throwing activities, as it contributes greatly to the acquisition and mastery of the technical motor performance and helps the economy in making effort and performance time and delaying the appearance of fatigue, and contributes greatly to the performance of smooth movements Influential and effective mastery of the technical aspect of performance, this is what was indicated by (Atiyat, 2015) in the importance of the flexibility of the trunk and its mechanics in influencing the technical performance of throwing the tool, this result agrees with (Fraud et al, 2007), where he indicated that physical attributes such as Strength, speed and flexibility are among the basic physical attributes that make up performance and that can affect it directly.

As for the correlation of the variables related to the effectiveness of the jump (triple- and high), the results showed as in Table no. (7) a strong correlation for the transition speed and the numerical level of the effectiveness of the triple jump among the sample members, and also

showed a medium correlation for the variables (body mass index, explosive force, speed characteristic of the muscles of the legs, flexibility of the back and shoulders muscles) and the numerical level of the efficacy of the triple jump and the jump the high jump among the study sample members, but it is not statistically significant, and there is no correlation between the strength characteristic of speed and the numerical level of the effectiveness of the high jump.

The researchers attribute this strong correlation to the transition speed and the numerical level of the effectiveness of the triple jump, and a weak relationship with the high jump, but it is not statistically significant. He needs to maintain his speed to produce the maximum force he has from the jump in the three jump stages (hopsotch, step, and jump), so the jumper must make good use of the process of linking horizontal speed to the strength of the rise, where the ability to rise strongly and quickly is one of the strong qualities and the necessity that the jumper needs to achieve the effectiveness of the triple jump, so the triple jumper must develop the strength of the muscles of his legs, because these muscles need in the triple jump a great ability to bear the weight of three consecutive jumps, and the jumper also needs a great strength for the muscles that are in the process of extending The hip joint, the foot joint, the strength of the muscles of the lumbar region of the spine, in addition to strengthening the basic working muscles, it is necessary to strengthen the other muscles in general. This was confirmed by (Guthrie, 2003) in that the triple jumper must be characterized by special physical and 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, so speed must be associated with Strength, as the horizontal speed through the approach phase with its association with the force contributes to increasing the player's momentum and rising to the highest possible distance, as the horizontal speed turns into a vertical speed and thus increases the performance distance. The results of this study agree with (Wilson et al, 2009); (Birch et al., 2005) on the importance of transitional speed, explosive power and speed-distinguishing strength when training triple jump players for

their high contribution to the progression of the level of achievement.

The researchers also attribute the existence of a medium correlation (for the body mass index (BMI), and the numerical level for the effectiveness of the triple jump and the high jump, and this is due to the fact that the average body mass index (BMI) among the study sample members is within the normal rate according to the classification of the World Health Organization, where it refers to the equation for calculating the index The body mass, which is equal to (mass / length², kg / m), and that there is no increase in the weight of individuals, and that the lower the weight, the greater the ability to move, and that the increase in weight leads to a weak ability to move and thus weight becomes an obstacle to performance, and since the increase in The weight and mass of the body requires individuals to exert more 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 thrust and rise to the top and thus the individual's ability to perform better, as the increase in Weight is one of the obstacles to muscular ability, as it acts as an obstacle to both strength and speed in the field of activities that require rapid movements (Hussain & Nassif, 1980).

In contrast to obese bodies, in addition to the fact that the appropriate body with less weight is less exposed to gravity, as it can be resisted and perform better jumping, this was confirmed by (Hara,1971) that the ability of the lower limbs decreases with an increase in body mass index than the normal situation, as the weight of the body plays the results of this study agree with the results of the studies of: (Al-Zoubi, 2016); (Al-Agha & Amer, 2010), where the results of their studies indicated a correlation between body mass index and the explosive strength of the muscles of the legs.

With regard to the explosive force of the muscles of the legs, it plays a major role in increasing the force of the two legs to the ground, as the horizontal velocity is transformed into a vertical velocity, which increases the distance of the jump to the top. And opposite to it in the direction", meaning that the explosive power of the legs possessed by the sample members helped increase the force of their pushing to the ground with their maximum

strength, which contributed to increasing the distance of the upper jump. It can lead to reaching the highest possible distance, as the player needs great strength for the muscles that extend the hip joint and the foot joint, as well as the muscles of the lumbar region of the spine, enabling him to be able to rise and push strongly upwards and reach the level of digital performance, and that one of the most important stages Which leads to reaching a good level in the high jump is the approaching stage, where the player acquires the appropriate horizontal velocity (cruise speed) that achieves an appropriate flight angle that helps him achieve the best achievement in the jump.

Conclusions and Recommendations

The researchers revealed following conclusions:

- There is a correlation for BMI with some types of special strength, flexibility of the back and shoulder muscles, and transitional speed, as well as its relationship to the digital level of throwing and jumping activities, since the sample members are novice students.
- Every athlete has his own equation that the coach and the player must know and know so that he can train based on it, as this depends on the physical, physical and kinetic specifications of each player.

Recommendations

In light of the findings of the study, the researchers proposed the following recommendations:

1. The need for workers in the field of education and training in athletics to pay attention to the need to focus and pay attention to knowing the body mass index and the elements of physical fitness in the sports field, especially throwing and jumping activities, because of their importance in teaching curricula and training programs due to their positive contribution to improving technical performance and the digital level of throwing and jumping activities achievement.
2. Work on conducting similar research and studies to prepare proposed programs that define the importance of BMI in the sports field and its relationship to various individual and team sports, as well as special physical

characteristics with performance, which would achieve results and reveal other results for the service of scientific research.

3. Benefiting from the results of this study by selecting the most appropriate of the novice students who are characterized by a good indicator of body mass, have physical and motor abilities and have the ability to develop them in order to supply the high teams with players to reach a better digital level in short distances.

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