

The Impact of a training program on some special physical abilities and the digital level of javelin throwing competition

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Introduction and research problem:

Track and field competitions are considered the basis for sports and Olympic games, as their competitions vary among running, jumping and throwing. These skills are displaying the individual's ability to perform physical activity in a way that expresses the natural movement of the human being. By following the amazing progress in the digital achievement of all athletics competitions, we note that it reflects a huge amount of scientific knowledge and information which contribute to this great development in performance until it reaches the limits of miraculous, And if the scientific method is the correct entrance to reach progress and development that goes along with global progress. Also, the use of scientific information and knowledge is the only way to overcome this severe shortcoming in the motor performance of the track and field competitions.

According to Murakami M et al. (2006) the javelin throwing competition is one of the Track and Field competitions that require special physical abilities and preparations since it depends on muscular ability. This forces the player to exploit all the potential forces he has to maintain the motor path of the center of gravity of the body and prepare the working muscles for contraction and produce the maximum instantaneous explosive force of the throwing arm on the same motor path to throw the tool to achieve the best digital achievement.

The researcher finds that the javelin throwing competition is one of the complex competitions that depends on the player's physical abilities and physical attributes and is affected by many mechanical variables such as speed, strength and other physical attributes. This competition is also characterized by rapid performance and that the total movements performed in it are simultaneous and integrated during the approaching stages (the last five

steps), especially in the last step (the final throwing stage). And that these stages require the coach to be precise in choosing the exercises for the quality of performance.

Javelin throwing competition requires many physical abilities such as strength, power, speed, agility, flexibility, coordination and balance. Abdul-Maasoud (2003) refers to the meaning of force as the ability of the muscle to confront external forces and defines it according to mechanical expression as the influence that changes the state of the body from rest or movement.

Also, Bastawissi Ahmed Bastawissi (1998) points out that focusing on developing muscular strength as one of the physical components has a major role in advancing the digital level of all throwing and pushing competitions. Where his influence appeared in the last era of this century, or rather in the last forty years.

Cloud Bouchard et al. (2005) shows that muscle strength is the most important physical component because of its direct impact on the rest of the physical components, as well as the level of motor performance. Muscle strength reduces the load on the joints, which contributes to developing performance while delaying the feeling of fatigue.

Strength characterized by speed is also the most important component of physical fitness for sprint, throw and jump competitions where the level of this component largely controls the digital level of these competitions. And it is worth noting here that the strength characterized by speed required for the javelin thrower. For example, it differs from that of the long jumper, the high jumper or the runner. It means that there is a strength characterized by speed that is in line with the specifications of the specialized race, and it varies from one competition to another.

Abu El-Ala Ahmed Abdel-Fattah and Ahmed Nasr El-Din Sayed (2000) indicate that the strength characterized by speed means that the ability of the nervous system to produce rapid force, which requires a degree of muscular strength and speed in one component.

Also, Edward T. Howley & B. Don Franks. (2001) mention that the strength characterized by speed is the ability of the muscle to exert a force quickly. (13:25)

Speed with strength and endurance are the main factors determining the level in different athletics competitions, and there is a strong relationship between strength and speed in particular, as these two components of physical fitness depend on the speed and strength of muscle contraction, and they also

participate in being affected by the quality of the muscle fibers involved in the performance.

There is no doubt that physical abilities are of great importance at the level of digital achievement of throwing competitions in general and in the javelin throwing competition in particular. And the order of importance for each physical characteristic varies according to its importance to the competition to be developed.

Young M. (2001) indicates that the javelin throwing competition is one of the athletics competitions that require special physical abilities and preparations since it depends heavily on muscular ability. This forces the player to exploit all his potential forces to maintain the motor path of the center of gravity of the body, prepare the working muscles for contraction and produce the maximum muscle power of the moment for the arm throwing on the same motor path to throw the tool to achieve the best digital achievement.

Abdul Rahman Zahran (2013) believes that the javelin throwing competition is one of the difficult competitions that depends on physical abilities and physical attributes and is affected by many variables such as (strength - speed and others) and this competition is also characterized by fast performance.

The researcher noted the importance of focusing on the physical variables related to the javelin throwing competition in a specialized way and putting in place exercises that work on developing these physical variables because of their great impact on the digital level of the javelin throwing competition.

Research Objective:

This research aims to design a proposed training program and identify its impact on:

- 1- Some special physical abilities of javelin throwers (muscular ability - speed - flexibility).
- 2- The digital level of the javelin throwing competitions.

Research hypothesizes:

- 1- There are significant statistical differences between the pre and post measurements in the physical ability's variables related to javelin throwing competitors, to the post measurement.

- 2- There are significant statistical differences between the pre and post measurements in the digital level of the javelin throwing competitions to the post measurement.

Research Terminology:

- **Specific Physical Abilities:**

"They are those physical characteristics required by the type of sports activity and are the result of the analysis of technical performance from its beginning to its end- Physically, chronologically, kinesthetic, muscular and physiological."

Research procedures:

1- **Research Methodology:**

The researcher used the experimental method, as it is considered the most appropriate method to achieve the objectives of the research, following the experimental design of one experimental group using the two measurements (pre- and post-test).

2- **Research Sample:**

The sample of the research was chosen in a deliberate way from the javelin throwers in Al-Ahly Sports Club and those registered with the Egyptian Athletics Federation for the 2021/2022 sports season. They are (7) players, and their age ranges from (16-18) years.

The researcher performed homogeneity for the selected research sample in the growth variables, physical abilities and the digital level of the javelin throwing competition, and Table No. (1) shows the description and homogeneity of the research sample.

Table (1)
Arithmetic mean, standard deviation, and skew coefficient for the research sample

N=7

Variables	Measuring Unit	Arithmetic Mean	Standard Deviation	Skewness
Age	Year	16.01	0.78	0.05
Training Age	Year	4.92	0.84	0.59
Height	Cm	169.86	4.41	-1.46
Weight	Kg	68.43	3.38	0.80

Table No. (1) shows that the Skew coefficients ranged from (-1.46: 0.80) and was limited to (± 3), which indicates that the research sample is homogeneous in growth variables, and its results can be moderately representative of the community.

Data Collection Tools and Tests:

1- Physical and digital tests:

Physical tests that measure the variables under study have been identified.

- 30m sprint test from flying start (to measure speed)
- Throwing a medical ball 3 kg forward (to measure the strength of the arms)
- Bridge test (to measure flexibility)
- Agility Ladder Test (to measure compatibility)
- Multi-directional running test (to measure agility)
- One-foot stand test (to measure balance)
- Shuttle running test (to measure respiratory cyclic endurance)
- Digital level test for javelin throwing competition (attached no.2)

The survey Study:

The survey was conducted from 07/11/2021 to 09/11/2021 with the aim of determining the following:

- Ensure that the physical tests under study are suitable for the research sample.
- Ensure the validity of the tools used under study before applying the experiment.
- Determining the basics of qualitative exercises to reach the final form.
- Conducting scientific treatments for the tests used under study.

Training unit example:

- The aim of the unit: Develop some specific physical abilities and raise the digital level.
- Preparation period: private.
- Training unit time: 90 minutes.
- The intensity of the unit: from 60%: 80%
- Intensity of the program: ranging from (1:1)

		spear, starting with the beginning of the approximate run and ending with the beginning of the spear pull. The goal is to achieve the best approach speed.	8	2	
Cool down	10 mins.	Relaxation exercises: -Standing with swinging the arms forward and backward. - Sitting with the knees fixed and rocking the legs. -Light jogging around the field on the grass.			

Scientific treatments for the used tests:

The researcher used the validity of differentiation to verify the validity of the tests under study, on an unexceptional sample consisting of (5) young women, and the exceptional sample is the exploratory research sample, consisting of (5) beginners, on 01/03/2022 and 02/03/2022. The following table shows the significance of the differences between the two samples in the tests used in the research, as shown in Table (2).

Table (3)
Validity coefficient for physical and digital tests

N1=N2=5

Variables	Tests	Measuring unit	Arithmetic mean of the exceptional group	Arithmetic mean of the unexceptional group	The average of rank		Z	Sig. (p-value)
					The Exceptional Group	The Unexceptional Group		
Transition speed	30m sprint test from flying start	Sec.	5.59	7.32	4.64	6.36	-2.56	0.010
Muscular capacity	Throwing a medical ball 3 kg forward	M.	7.20	5.54	6.36	4.64	-2.57	0.010
Flexibility	Bridge test	Cm.	70.00	89.00	4.56	6.44	-2.26	0.024
Compatibility	Agility Ladder Test	Sec.	10.53	13.15	7.53	3.47	-2.76	0.006

Agility	Multi-directional running test	Sec.	15.22	20.05	4.64	6.36	-3.03	0.002
Balance	One-foot stand test	Sec.	12.00	7.25	6.00	5.00	-2.26	0.024
Endurance	Shuttle running test	Min.	11.35	10.45	4.66	6.34	-2.76	0.006
Digital Level		M.	32.14	24.29	6.46	4.55	-3.14	0.002

* Statistically significant when Sig.(p-value) < 0.05

It is obvious from Table (3) that all the calculated p-value range between (0.002: 0.024), which is less than the 0.05 level of significance for all physical tests and the digital level under study, which means that the difference between the two groups is significant and has statistical significance, which indicates that the ability of these tests to distinguish between levels, as they are valid tests to measure the characteristics for which they were made.

Stability coefficient for physical tests:

The stability coefficient of the tests was found by using the application method and re-applying it to the exploratory research sample with an interval of three days from the first application. The correlation coefficient between the two applications was calculated as shown in Table (3).

Table (4)
Correlation coefficient between the first and second application of the exploratory sample, the special physical abilities and the digital level under study to calculate the stability

N=5

Variables	Tests	Measuring unit	The First Application		The Second Application		R-Value
			Arithmetic mean	Standard Deviation	Arithmetic mean	Standard Deviation	
Transition speed	30m sprint test from flying start	Sec.	5.59	0.15	5.57	0.16	0.951*
Muscular capacity	Throwing a medical ball 3 kg forward	M.	7.20	1.46	7.55	1.49	0.989*
Flexibility	Bridge test	Cm.	70.00	2.13	68.25	2.16	0.977*

Compatibility	Agility Ladder Test	Sec.	10.53	1.73	10.25	1.56	0.994*
Agility	Multi-directional running test	Sec.	15.22	1.35	15.00	1.63	0.986*
Balance	One-foot stand test	Sec.	7.13	2.25	11.51	2.15	0.785*
Endurance	Shuttle running test	Min.	11.48	1.22	11.12	1.19	0.671*
Digital Level		M.	32.14	1.95	31.57	2.23	0.861*

* The value of "r" tabulated at the level of significance (0.05) = 0.754

It is obvious from Table (4) that all the values of the correlation coefficient are significant at the level of significance (0.05) for all the physical tests and the digital level under study, where the results of the table indicated that the calculated (r) values ranged between (0.671, 0.994) while the value of tabulated (r) is 0.754 and this indicates that the correlation is significant between the first and second applications, which indicates the stability of those tests.

The Pre- measurements:

The researcher made the pre- measurements on the experimental group, which are as follows:

- Conducting the measurements for the physical tests and the digital level on 14/01/2022.
- Conducting measurements of the kinematic range of the upper edge joints (shoulder joint - elbow joint - wrist joint) on 15/01/2021.

Implementation of the proposed preventive training program:

The aim of the proposed preventive training program:

- The training program aims to develop the special physical abilities under study and the digital level of the javelin throwing competition in the research sample.

The fundamentals that the researcher considered when establishing the program:

- Adhering to the principle of diversity in special exercises to develop special physical abilities.
- Considering the individual differences between the research sample.

- Pay attention to warm-up and cool-down.
- Flexibility of the program and its acceptance of practical application.
- Observe the principles of training in gradient load.
- That the program achieves its aims.
- Integration of parts of the program.

Determine the period of implementation of the preventive program:

The researcher reviewed many references and previous researches to determine the most appropriate period for implementing the training program, and the researcher determined the period of implementation of the program as (10) training weeks, and that this period is sufficient to make changes in the players' physical abilities and develop their digital level, at the rate of (3) training units per week, at (30) training units.

The Basic experiment :

The researcher conducted the basic experiment by applying the content of the proposed preventive training program to the members of the research sample in the period from 16/01/2022 to 01/04/2022 for a period of (10) weeks at the rate of (3) training units per week.

The post measurements:

The researcher applied the post measurements on the experimental group on 04/05/2022 with the same procedures, conditions, and order in which the pre- measurements were applied.

Statistical treatments:

The researcher used the following nonparametric statistical treatments:

- SMA.
- Standard deviation.
- Mediator.
- Skewness Coefficient.
- Correlation coefficient.
- Percentages of improvement.

Presentation and discussion of results:

First: Presentation of results:

Presenting the results related to the first hypothesis, which states:

“There are significant statistical differences between the pre and post measurements in the physical ability’s variables related to javelin throwing competitors, to the post measurement.”

Table (5)
The significance of the differences between the pre and post measurements in the physical variables under study

N=7

Variables	Tests	Measuring unit	Arithmetic mean for the pre - measurement	Arithmetic mean for the post measurement	The average of rank		Z	Sig. (p-value)
					(-)	(+)		
Transition speed	30m sprint test from flying start	Sec.	5.59	4.40	0.00	4.00	-2.81	0.00
Muscular capacity	Throwing a medical ball 3 kg forward	M.	8.20	12.23	0.00	4.00	2.85	0.00
Flexibility	Bridge test	Cm.	70.00	43.35	0.00	4.00	-2.81	0.01
Compatibility	Agility Ladder Test	Sec.	10.53	7.40	0.00	4.00	-2.91	0.00
Agility	Multi-directional running test	Sec.	15.22	9.43	0.00	4.00	-2.80	0.01
Balance	One-foot stand test	Sec.	8.49	12.25	0.00	4.00	-2.83	0.00
Endurance	Shuttle running test	Min.	11.39	9.25	0.00	4.00	-2.81	0.00

* Statistically significant when Sig.(p-value) < 0.05

It is obvious from Table (4) that all the calculated (p-value) are less than the level of significance 0.05 for all the physical tests under study, which means that the difference between the two measurements (Pre and post measurement) is significant and the differences are statistically significant to the post measurement.

Table (6)
The Arithmetic mean, standard deviation and Improvement percentage of the physical variables under study

N=7

Variables	Tests	Measuring unit	Pre- Measurement		Post Measurement		Improvement Percentage %
			Arithmetic mean	Standard Deviation	Arithmetic mean	Standard Deviation	
Transition speed	30m sprint test from flying start	Sec.	5.59	0.53	4.40	0.49	21.28%
Muscular capacity	Throwing a medical ball 3 kg forward	M.	8.20	1.46	12.23	1.57	49.14%
Flexibility	Bridge test	Cm.	70.00	4.13	53.35	3.44	23.78%
Compatibility	Agility Ladder Test	Sec.	10.53	2.73	7.40	2.57	29.72%
Agility	Multi-directional running test	Sec.	15.22	2.35	9.43	1.31	38.04%
Balance	One-foot stand test	Sec.	8.49	2.25	12.25	1.56	44.28%
Endurance	Shuttle running test	Min.	11.39	1.22	9.25	1.13	18.78%

It is obvious from Table (6) that there is an improvement in all the physical tests under study with improvement rates ranging between (49.14%) for the medical ball throwing test of 3 kg as the highest percentage, and (18.78%) for the shuttle running test as the lowest percentage.

Presenting the results related to the second hypothesis, which states:

“There are significant statistical differences between the pre and post measurements in the digital level of the javelin throwing competitions to the post measurement.”

Table (7)

The significance of the differences between the pre and post measurements in the digital level of the javelin throwing competition

N=7

Variables	Measuring unit	Arithmetic mean for the pre - measurement	Arithmetic mean for the post measurement	The average of rank		Z	Sig. (p-value)
				(-)	(+)		
Digital Level	M.	32.14	38.52	0.00	4.00	-2.80	0.01

* Statistically significant when Sig.(p-value) < 0.05

It is obvious from Table (7) that the calculated (p-value) is less than the 0.05 level of significance in relation to the digital level of the javelin throwing competition in the research sample, which means that the difference between the pre and post measurements is significant and statistically significant to the post-measurement.

Table (8)

The Arithmetic mean, standard deviation and Improvement percentage between the pre and post measurements of the digital level of the javelin throwing competition

N=7

Variables	Measuring unit	Pre- Measurement		Post Measurement		Improvement Percentage %
		Arithmetic mean	Standard Deviation	Arithmetic mean	Standard Deviation	
Digital Level	M.	32.14	2.95	35.52	2.05	10.51%

It is obvious from Table (8) that there is an improvement in the digital level of the javelin throwing competition to the post measurement of the research sample, and the improvement rate is (10.51%).

Second: Discussion of results:

Discussing the results related to the first hypothesis, which states:

“There are significant statistical differences between the pre and post measurements in the physical ability’s variables related to javelin throwing competitors, to the post measurement.”

It is clear from the results of Table (4) that all the calculated (p-value) are less than the level of significance 0.05 for all the physical tests under study

which means that the difference between the pre and post measurements is significant and the differences are statistically significant in favor of the post measurement.

Also, the results of Table (5) shows that there is an improvement in all the physical tests under study, with improvement rates ranging between (49.14%) for the 3 kg medical ball throwing test, and (18.78%) for the shuttle running test.

The researcher attributes these results to the fact that the proposed preventive training program contains a set of exercises for the development of these physical variables; The program contained a set of exercises to develop speed, muscular ability of the arms, flexibility of the spine, agility, balance, muscular endurance, compatibility, which had a positive impact on the physical variables under study.

Abdul Rahman Zahran (2001) also mentions that the javelin throwing competition needs to develop the various components of physical fitness with attention to special physical abilities, and indicates the importance of muscular ability and speed, and this is consistent with the results of the research.

Owais Al-Jabali (1998) points out the importance of developing the special physical abilities of the javelin throwers and focusing the preparation programs on arranging the importance of these qualities in terms of importance, the most important and the least important, which is the strength characteristic of speed, flexibility of the spine, agility, compatibility, balance, as he indicated the need to build training programs according to the order of importance of these qualities.

These results are in agreement with the study of Amjad Zakaria and others (2021), Muntazer Muhammad and others (2020), Muhammad Abdul Hamid and others (2021) and Ahmed Abdel-Mardi (2019) which approved that the use of training programs led to the development of physical abilities and the improvement of muscle tone among javelin throwers, such as muscle ability, speed and other physical variables, and this is consistent with the results of the research.

Discussing the results related to the second hypothesis, which states:

“There are significant statistical differences between the pre and post measurements in the digital level of the javelin throwing competitions to the post measurement.”

It is clear from the results of Table (6) that the calculated (p-value) is less than the 0.05 level of significance in relation to the digital level of the javelin throwing competition in the research sample, meaning that the

difference between the pre and post measurements is significant and statistically significant in favor of the post measurement.

It is also clear from the results of Table (7) that there is an improvement in the digital level of the javelin throwing competition in favor of the post measurement of the research sample, and the improvement rate is (10.51%).

The researcher attributes these results to the use of the proposed preventive training program, which included a development of the physical variables of the javelin throwing competition, which had a positive impact on the development of the digital level of the research sample of javelin throwers.

In this regard, Mr. Abdel-Maqsoud (2003) mentions that the levels of achievement in many activities are determined according to the level of strength, muscular ability and speed, and in some activities, they have a common effect.

Muhammad Al-Sayed Khalil (1991) confirms that the digital achievement in the javelin throwing competition depends on the competitor's ability to exploit the distinctive force of speed according to the technical and biomechanical foundations of the movement.

These results agree with the study of Muhammad Abdul Hamid et al. (2021), Muntazer Muhammad et al. (2020), Ahmed Abdul-Mardi (2019), Hyeyoung Kim et al. (2014), which proved that the training programs for the javelin throwers include exercises related to muscular ability, speed, muscular balance, agility and compatibility because of their positive impacts on the digital level among javelin throwers.

The Conclusions:

Considering the sample, aims, hypotheses, procedures and results of the research, the researcher reached the following conclusions:

- 1- There are significant statistical differences between the pre and post measurements to the post measurement in the physical variables under study.
- 2- There are significant statistical differences between the pre and post measurements to the post measurement in the digital level of javelin throwing.

The Recommendations:

Within the limits of the results and conclusions that have been reached, the researcher recommends the following:

- 3- Using preventive training programs to develop the physical abilities of the javelin throwing competition and reduce the exposure of the contestants to injuries.
- 4- Using preventive training programs to develop the special physical abilities of all age groups in the field of training, considering the individual differences between them.
- 5- Conducting such a study on samples of different age and gender in the javelin throwing competition.
- 6- Conducting such a study on other throwing competitions in the field competitions.
- 7- Directing the results of this study to the workers in the field of javelin throwing competition for the possibility of benefiting from these results.

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