

## "The impact of Tabata training on the development of the endurance and score level of walking juniors"

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### Research Introduction and problem:

Scientific progress in all fields is considered to be the feature of this era, which has prompted many countries to submit all possibilities to scientific research, so that they can keep pace with the progress and development that touched on all life feilds.

**Mohamed Mahmoud Abdel Zaher (2014)** points out that sports training is one of the vital processes that are indispensable which can help the athlete reach the maximum extent of his limits, human abilities and functional systems to achieve the highest score level and possible motion performance. (5:19)

**Abdul Rahman Zaher (2009)** states that field and track competitions are considered one of the most common sports in the world. It is a competitive sport of a special nature and has great importance among various other sports. (4:1)

There have been many different training methods recently, including tapata training, which have been used and applied by sports experts in various sports activities because of their positive effects on physical abilities, especially in increasing muscle tissue, developing muscle strength and endurance, and burning fats.

**Drigny J et al. And others (2014)** point out that Tabata training is one of the intermittent training methods where athletes perform exercises and then stop during breaks. Tabata training is also one of the intermittent high-intensity training methods, which varied greatly in terms of the characteristics of the training exercise, that is, the position and intensity of the exercise, the duration of exercise and rest. (8:46)

**Medbø (2001)** explains the use of the term "Tabata training", which emphasizes not only the procedure but also the intensity of trainings up to

(7:8) groups, and the intensity of training in the Tabata training style is fixed and reaches (170%) of the maximum oxygen consumption  $VO_{2max}$  from the first unit to the last unit of the training program. (15:67)

### **Tabata exercises:--**

It is one of the modern sports exercises aimed at enhancing the strength and endurance of the body, relying on the effort exertion and internal energy of the body, Tabata exercises were created by a doctor named Isoumi tabata, so it is named after him. These exercises are highly capable of developing physical abilities and burning fat, by increasing the metabolic rate when practiced on a regular basis. (21)

The Tabata training method was first discovered by a Japanese scientist named Dr. Izumi Tabata and a team of researchers from the National Institute of Fitness and Sports in Tokyo. Dr. Isoumi Tabata and his team of researchers conducted research on two groups of athletes. The first group was trained at a moderate intensity level while the second group was trained at a high-intensity level, the moderate intensity level group worked for five days a week for six weeks, each session lasted for an hour. While high-intensity level group worked for four days a week for six weeks, each workout lasted for Four minutes (20 seconds of training with 10 seconds of rest between each exercise group).

How to perform tabata exercises?

Tabata training dosent depend on the sets and repetitions method as in the traditional style, it depends on timing, and it performed as follows: 20 seconds of training and then 10sec of negative rest for 8 times per exercise of 4 minutes per exercise total time.

### **The conclusions result in:**

- The aerobic system (cardiovascular) of the first group increased but showed little or no results for their anaerobic system.
- While the second group showed an increase in its aerobic system more than the first group, and its anaerobic system increased by 28%.

[Therefore High intensity training has a greater impact on both aerobic and anaerobic systems]. (22)

Tabata exercises are intense, fast and four-minute repetitive movements. Each minute includes two 20-second workout cycles, and two

10-second rest cycles, alternating with each other. During the intensive cycle, the body is loaded to the maximum, and during rest it is used to restore breathing, and there are many types of Tabata exercises. (23)

### **Experts divided these exercises into two divisions:**

#### **• Tabata exercises for beginners**

Maintain the same duration and exercise sets but in a different order (15 seconds training - 15 seconds rest - total exercises 8 - duration 4 minutes).

The most recommended exercise for beginners is running in the same place.

#### **• Tabata exercises for advancers**

A person who has practiced tapata exercises for a long time can have wider options that yield greater benefits and higher rates, for example instead of doing 8 exercise sets at once. This set can be repeated twice and get 8 minutes of Tabata exercises with a break of one to two minutes. The exercise becomes as follows:

(20 seconds exercise, rest 10 seconds, duration 4 minutes, rest duration of 1 to 2 minutes, repeat the exercise, total of exercises 16 sets).

In addition, a new training style can be done that requires more effort, which is to combine two types of movements with one training, for example, instead of doing squat movement for four minutes, Sqat movement can be combined with push up movement in one exercise for four minutes.(23)

Endurance is one of the most important elements for many sports, especially the walking competition, which depends on the amount of energy generated by how tri-adenosine phosphate (ATP) is consumed, for the aerobic or anaerobic energy consumption systems of the body, and the energy system suitable for sports activity is developed by physical load.

**Rich (2013)** points out that The most important changes that occur in muscles using the Tabata training method is that it improves muscle endurance by forming more lactate in the muscles, which leads to the production of glucose-proportional ATP in high-intensity exercises, where muscle capacity reaches (37%) after 8 weeks of performing Tabata exercises.

Athletes should use training methods that target fitness components, and obtain the best results in accordance with the principles of training. (7:20)

**Sumpena&Sidik (2017)** see that trainers can raise the physical efficiency of athletes through the use of Tabata exercises, the advantages of Tabata training are fat burning, increasing the metabolism of the athlete during and after training, being effective in their implementation, improving anaerobic and aerobic abilities, and the ability to use them in various activities. (17:10)

By reviewing the results of national and international championships in recent years with the records of the Egyptian Athletics Federation for amateurs, it is clear to us how amazing the numbers have developed until they reached the limit of human miracles, the world record for the race of 10 km walked is (42:47m) by **Anazka Drahutova**. The Arab record is (46.43m) for Tunisian player **Shahinaz Nasri**, while the Egyptian record for the race of 10 km walked is (53:37 m) for the player **Bassant Ramadan Hosni**.

There is a huge difference between the level of the world record and the level of the Egyptian record of females, and this amazing development is due to several overlapping factors, including the implementation of the results of scientific research and choosing the best training methods to achieve the best score levels.

The researcher believes through her experiences as a player that endurance and strength are important elements of the walking race. From this point of view, the idea of research came up using the Tabata training method, as one of its benefits is that it develops strength and endurance.

### **Research Importance:**

#### **• Scientific importance of research:**

- 1- This research is a starting point to identify the impact of Tabata training on track players, especially walking competitions.
- 2- Enriching the cognitive and scientific aspects of coaches and players with the importance of focusing on the element of endurance for juniors and how to develop them using Tabata exercises.

**• Applied importance:**

1. Improve muscle and respiratory circulatory system efficiency for juniors.
2. Developing the score level of walking juniors.
3. The diversity of the rhythm of training methods to add the element of suspense for walking juniors.
4. Save time, effort and money used in the process of preparing walking juniors.

**Research objectives:**

The research aims to the designing and rationing of the Tabata training during the personal preparation period for walking juniors under (18) years and to identify their impact on:

- 1- Endurance element of walking juniors.
- 2- The score level of the walking competitions.

**Research thesis:**

- 1- There are statistically significant differences between the pre- and post-measurements in the endurance variable of walking juniors in favor of the post measurement of the experimental group.
- 2- There are statistically significant differences between the pre and post-measurements in the score level of walking juniors in favor of the post measurement of the experimental group.

**Search procedures****Research Methodology:**

The researcher used the experimental method by observing the pre and post measurements of a single experimental group as it is suitable for the nature of the research.

**Research sample and community:**

The research community was selected in the deliberate way from the under-18 walking competition juniors at Al Ahly Club who are registered in the Egyptian Athletics Federation for the 2020/2021 season. They numbered (15) juniors and were divided as (10) juniors to conduct the basic experiment, and (5) juniors from the research community and out of the basic research sample to conduct the survey experiment.

**Table (1)**  
**Statistical characterisation of the sample**

(N=15)

s	samples	Juniors number	percentage
1	Survey study sample	5	33.33
2	Basic study sample	10	66.66
	<b>total sample</b>	<b>15</b>	<b>100</b>

### Homogeneity of Research Sample:

The researcher performed homogeneity among the members of the research sample in some anthropometric, physical and score variables of the walking competition under research, and included variables (age - training age - height - weight - endurance variables - score level), tables (2) (3) show this.

**Table (2)**

**Arithmetic mean, standard deviation, and torsion coefficient of the research sample in variables (Age - Height - Weight - Training Age - score Level)**

(N=15)

variables	The measurement unit	Arithmetic mean	standard deviation	torsion coefficient
age	year	16.75	0.886	0.615
height	cm	158.88	2.356	0.413-
weight	kg	51.25	2.815	0.326
Training Age	sec	2.5	0.755	1.322
score Level	sec	26.72	4.22	0.21

It is clear from Table (2) that the torsion coefficients have ranged between (-0.413 \ 1.322), confined between ( $\sqrt{\pm}$ ) which indicates the moderation of the data and the homogeneity of the research sample in variables (age - height - weight - training age - score level).

**Table (3)**

**Arithmetic mean, standard deviation, and torsion coefficient of the research sample in Endurance variable under consideration**

(N=15)

Physical variables	tests	The measurement unit	Arithmetic mean	standard deviation	torsion coefficient
Muscle endurance of the legs	Vertical jump test from lunge mode	Repeat / second	14.12	4.39	0.17



<b>Endurance for center muscles</b>	<b>Center muscle strength test (blank)</b>	sec	٧٢.٥	٤١.٦١	٠.٠٧
<b>Muscle endurance of arms</b>	<b>modified pressure test for girls (push up)</b>	<b>Repeat / second</b>	١٦	٧.٥٦	١.٢١١
<b>General endurance</b>	<b>Burpees quad jump test</b>	<b>Repeat / second</b>	١٨.٣٧	٢.٨٧	٠.٦٥

It is clear from Table (3) that the torsion coefficients have ranged between (0.07 / 1.211), that is confined between ( $\bar{r} \pm$ ), which indicates the moderation of the data and the homogeneity of the sample in the endurance variables (muscle endurance of the legs, endurance of the center muscles, muscle endurance of the arms, general endurance).

### Means and tools of data collection:

#### First, the machines and tools used in the research:

- Stop watch.
- Restameter for measuring height (cm).
- Medical scale for measuring weight (kg).
- Leg press.
- Swedish seat
- Different height split boxes.

#### Second, the physical tests used in the research:

The researcher designed a questionnaire form to poll experts to determine the research variables (physical abilities and tests for the walking competition).

#### Attachment (2)

The researcher also reviewed the opinions of the experts and deleted the physical abilities that were taken less than (25%), and these tests obtained (75%) and more.

### Attachment (3)

- Burpee quad jump test to measure overall endurance (repetition/second) (14:85).
- Test jumping up from lunge position and switching the two legs in the air and then lunge measuring the endurance of the two legs (repetition / second) (13:100).
- Modified pressure test for girls push up to measure arm strength (repetition / second) (14:25).
- Stability test on elbows and feet from blank to measure the strength of the center muscles (second) (14:40).

### Third, measuring the score level:

Measure the distance of (4) km walking to measure the score level (second) through three assistants and calculate the best number to the nearest second.

### Fourth, the forms:

- Expert consultation form on tests appropriated to the nature of the research (**Attachment 2**)
- Expert consultation form on the duration, period and the number of repetitions of the exercises used in the research. In which parts of the training unit can be carried out Tabata exercises (**Attachment 3**)
- data registration form to characterize the sample. (**Attachment 5**)
- physical ability results registration form. **Attachment 6**)

### The survey study:

The researcher conducted the survey from 28/12/2020 to 31/12/2020, on (5) walking juniors contestants from the same research community and outside the basic research sample to apply the tabata training and physical tests under research in order to identify the following:

- The validity of the tools and machines used in the search.
- The appropriateness of the tests applied to the research sample.
- How appropriate the workouts are for the research sample.
- Arrange the application of physical tests under research.
- Discover the obstacles that the researcher may face in the research application.
- Conducting scientific transactions for the physical tests under research.



## Scientific treatments of the tests under research:

### 1- The veracity of the tests:

The researcher used the sincerity of differentiation to ensure the veracity of the tests under research, on a non- distinctive sample consisting of (5) juniors, while the distinctive sample is the survey research sample, and it's consisting of (5) juniors on the day 2/1/2021. The following table shows the significance of the differences between the two samples in the tests used in the research.

**Table (4)**  
**The significance of the differences between the distinctive and non- distinctive group means in physical abilities**  
**(N1=n2=5)**

Physical abilities	tests	Unit of measurement	Distinctive group		non- distinctive group		T VALUE	Significance level
			Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
Leg muscles endurance	Jump from lunge	Repetition\second	13.20	2.28	7.60	1.14	*4.91	significant
Central muscles endurance	blank	sec	41.00	11.38	19.20	14.76	3.95*	significant
Arm muscles endurance	Modified push up for girls	Repetition\second	10.80	4.65	5.20	1.30	*2.60	significant
General endurance	Quad burpees	Repetition\second	18.20	2.16	9.20	1.64	7.40*	significant

- T Value at 0.05 morale level is 1.828

Table (4) shows statistically significant differences between the distinctive group and the non-distinctive group in all the physical tests under research, which indicates the sincerity of the tests used.

### 2-Tests persistence:

The researcher used the method of applying the test and then reapplying it (test & retest) at an interval of (6) days to ensure the tests persistence under research, to the sample of the survey study consisting of (5) players in the same order and the same conditions in the first and second application on the day 4/1/2021. The following table (5)

demonstrates Correlation coefficients between the first and second applications.

**Table (5)**  
**Correlation coefficients between the first and second applications**

(n=5)

Physical variables	tests	Unit of measurement	First application		Second application		Correlation coefficient	Significance level
			Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
Leg muscles endurance	Jump from lunge	Repetition/second	13.20	2.28	12.00	3.60	0.98**	significant
Central muscles endurance	blank	sec	41.00	11.38	41.40	11.84	0.99**	significant
Arm muscles endurance	Modified push up for girls	Repetition/second	10.80	4.65	10.40	5.41	0.99**	significant
General endurance	Quad burpees	Repetition/second	18.20	2.16	18.60	2.07	0.91**	significant

\*Tabular C value at a moral level (0.05) is 0.564

It is clear from Table (5) that the values of correlation coefficients ranged from (0.79-0.99) and are all statistically significant, indicating a statistically significant correlation between the first and second applications, which indicates that the tests used in the research are highly persistent.

### **Operational Steps of Research:**

#### **First the pre measurement:**

The researcher made the pre-measurement of the main research sample of (10) juniors

And that's as follows:

- The anthropometric tests (age, height, weight), and the physical tests under research were measured on 9/1/2021 at the Olympic Center in Maadi.
- The score level (4 km walks) was measured on 12/1/2021.

#### **Second, the application of Tabata exercises:**

Tabata training was applied in the main sample in the time period from 17/1/2021 to 11/3/2020, for a period of (8) weeks, by three training

units per week, and the time of Tapata training within the training unit was (30) minutes, on the Olympic Center track and the Olympic Center Gymnazyne Hall in Maadi.

### Third, the post measurement:

- The researcher conducted the post- measurements of physical tests and the score level measurement of the basic research sample with the same conditions and controls of pre measurements on 14/3/2021, on the stadiums of the Olympic Center.
- The score level was measured on 16/3/2021.

### Statistical treatments:

After recording data of the variables under research and statistically processing them using the statistical program SPSS.

- Arithmetic mean
- Standard deviation.
- Torsion coefficient
- T value Test
- Percentages.
- Correlation coefficient

### Presentation and discussion of research results:

#### First, results presentation.

Within the limits of the research sample, objectives, assumptions and measurements used, and statistical treatments and analyses used in the research, the following results have been reached.

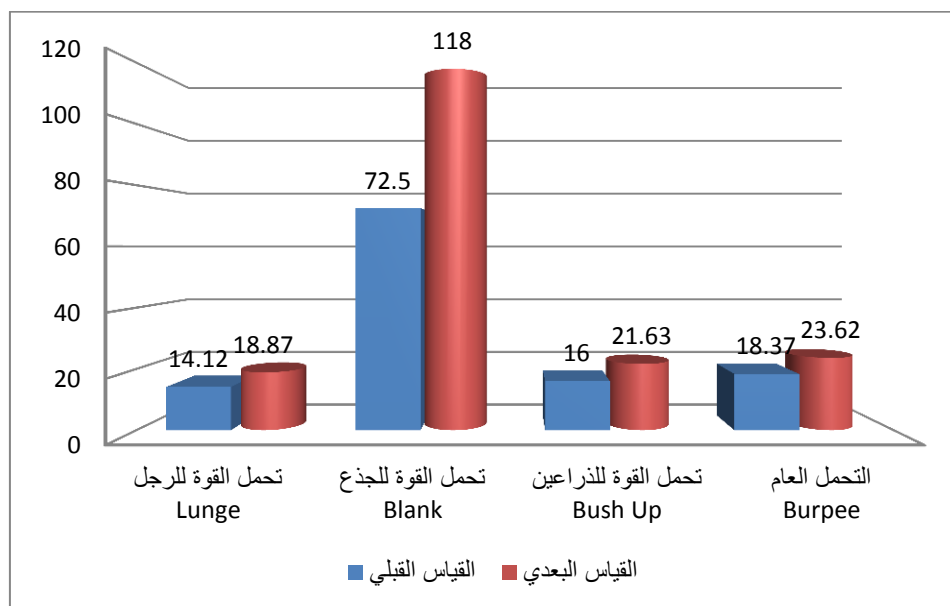
**Table (6)**  
**The significance of the differences and improvement rates between the pre and post measurements in the endurance variables of the research sample (N=10)**

Physical variables	tests	Unit of measurement	pre measurement		post measurement		T value	improvement rate
			Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
Leg muscles endurance	Jump from lunge	Repetition\second	١٤.١٢	٤.٣٩	١٨.٨٧	٣.٩١	٦.٣٣	%٣٣.٦٤
Central muscles endurance	blank	sec	٧٢.٥	٤١.٦١	١١٨	٤٤.٧٨	٦.٥٦	%٦٢.٧٦
Arm muscles endurance	Modified push	Repetition\second	١٦	٧.٥٦	٢١.٦٣	٥.٩٧	٣.٧٨	%٣٥.١٩

	up for girls							
General endurance	Quad burpees	Repe tition \\seco nd	١٨.٣٧	٢.٨٧	٢٣.٦٢	٣.٧٩	٥.٩٦	%٢٨.٥٨

**T Value at a morale level 0.05 = 1.812**

It is clear from the results of Table (6) that there are statistical differences between the two pre- and post-measurements in the endurance tests (vertical jump test from the lunge position - the strength of the center muscles - the modified pressure test for girls - the quad jump test) in the research sample of the juniors of the walking competition in favor of the post measurement, and the improvement rates ranged from (28.58) to the quad jump test as the lowest percentage, (62.76%) to test the strength of the center muscles as the highest percentage.



**Figure (1)**

The significance of the differences between the pre measurement mean, and the post measurement mean, of the endurance variable

**Table (7)**

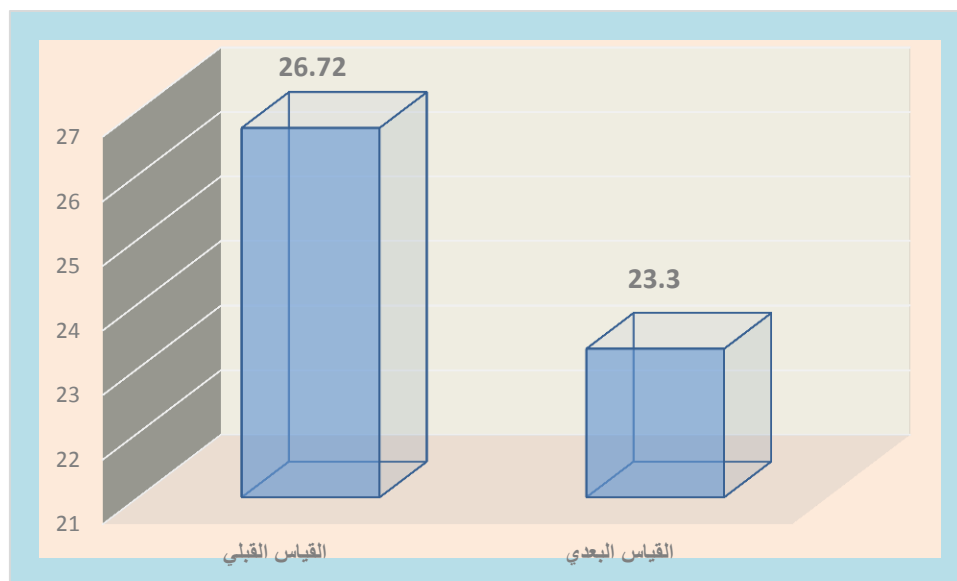
The significance of the differences and improvement rates between the two pre and post measurements at the score level in the sample

(N=10)

Physical variables	tests	Unit of measurement	pre measurement		post measurement		T value	improvement rate
			Arithmetic mean	Standard deviation	Arithmetic mean	Standard deviation		
Score level measurement	4km walking	min	٢٦.٧٢	٤.٢٢	٢٣.٣	٢.٤٦	٥.٣٦	% ١٢.٨

**T Value at a morale level 0.05 = 1.812**

It is clear from the results of Table (7) that there are statistically significant differences between the pre and post measurements in the score level of the walking competition in the research sample of juniors in favor of the post measurement, and the improvement rate reached (12.8%) for the (4 km) walking competition.

**Figure (2)**

The significance of the differences between the pre measurement mean, and the post measurement mean, of the score level variable

## **Second: the research results discussion.**

Discussion of the results of the first hypothesis, which states that "there are statistically significant differences between the pre- and post-measurements in the endurance variable of walking juniors in favor of the post measurement of the experimental sample."

It is clear from the results of Table (6) that there are statistically significant differences between the pre and post measurements in the endurance tests (vertical jump test from lunge position - center muscle strength - modified pressure test for girls - quad jump test) in the research sample of walking competition juniors in favor of the post measurement.

The researcher reduces these results to the use of high-intensity and frequent Tabata exercises in a short time interspersed with relatively short breaks, training time (20s), rest period (10s), an average of (8) repetitions in total (4m) per training, which in turn led to the development of endurance variables in the research sample of walking competition juniors. Through the previous presentation, the validity of the first hypothesis is achieved.

The results of the second hypothesis discussion, which states that "there are statistically significant differences between the pre- and post-measurements of the experimental sample in the score level of walking juniors in favor of the post measurement."

It is clear from the results of Table (7) that there are statistically significant differences between the pre and post measurements in the score level of the walking competition in the research sample of juniors in favor of the post measurement.

The researcher reduces these results to the improvement of the physical variables under research as a result of the use of Tabata exercises, which led to an improvement in the score level of the research sample of walking competition juniors by an improvement ratio of (12.8%). Through the previous presentation, the validity of the second hypothesis is achieved.

## **Conclusions and recommendations:**

### **First, conclusions.**

Of the objectives of the research and within the limits of the research and its procedures and from the reality of the data and information reached by the researcher and in view of the statistical treatments of those



data and through discussion and interpretation of the results, the researcher was able to reach the following conclusions.

- There are statistical differences between the two pre and post measurements in the endurance tests (vertical jump test from the lunge position - endurance of the strength of the center muscles - the modified pressure test for girls - the quad jump test) in the research sample of juniors of the walking competition in favor of the post measurement, and the improvement rates ranged between (٢٨.٥٨) for the quad jump test, (%٦٢.٧٦) for the strength of the center muscles test.
- There are statistically significant differences between the pre and post measurements in the score level of the walking competition in the research sample of juniors in favor of post measurement, and the improvement ratio reached (12.8%) for the (4 km) walking competition.

### **Recommendations.**

Through the researcher's conclusions, she recommends the following:

- The use of Tabata training in the training units in the personal preparation part to develop endurance in the walking race.
- Pay attention to the development of endurance for juniors from the early stages of practice to improve the score level in the walking race.
- Conducting more researches related to the use of tabata training because of its great benefit and effective impact on the training process and the development of physical abilities and score level in track competitions.
- Conduct similar studies to use tabata exercises for other levels and different ages.
- Conduct such a study using Tabata exercises on other samples of field and track competitors.
- Conduct such a study on various other samples of walking competitors.

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