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THE EFFECT OF A TRAINING PROGRAM USING TABATA TRAINING ON MUSCLE ENDURANCE AND SOME PHYSIOLOGICAL VARIABLES IN BASKETBALL PLAYERS

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Abstract.
The study aims to use high-intensity training for relatively short periods of time. The researchers focused their research on finding exercises that aim to make the body exert the maximum possible effort and bring its muscles to the maximum possible level of performance This is done by relying on the body's internal effort and energy without external effort and heavy weights to know the effect of these exercises on muscle endurance and their physiological effects on basketball players. The researchers chose their research sample intentionally, which is the players of the National Center for Sports Talent Care in Diwaniyah, numbering 10 players The researchers used the experimental method with the single-group approach to suit the research problem. The researchers conducted homogeneity for the players. In this study, the researchers targeted some variables and applied them to their research sample, which are muscular endurance, lactic acid tolerance, and heart rate. The method took a period of four weeks, with four training units per day The duration of the training units lasted from 50-60 minutes in each training unit and throughout the period of implementing the training program in order to know the effect of those exercises on those studied variables. After that, the researchers used statistical treatments for their training program in order to reach the clear effect of those exercises on the studied variables Statistics showed that Tabata exercises had a significant impact on the variables studied. In light of these results, the researchers explained their conclusions and recommendations based on the results obtained, as well as some important recommendations regarding this study What was reached after that is that Tabata exercises have a large and clear effect on the studied variables: muscular endurance, lactic acid tolerance, and also heart rate

Keywords*:* Tabata training, Muscle endurance, Lactic acid, Heart rate, Basketball players

Keywords Retired

Tabata exercises: are a type of exercise that is part of cardio and aerobic exercises. These exercises are considered somewhat new, as they have not been used or spread after a year In this year, Tabata exercises were discovered by Dr. Izumi Tabata and these exercises were named after him. Tabata training is often used synonymously with high-intensity interval training. These exercises began to appear after 1990 AD By the Japanese doctor Azumi Tabata, who was looking for a way to enhance the condition of the Olympic skiing

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team, relying on the body without external effort and heavy weights, in 1996 AD Tabata and colleagues conducted a study on the effectiveness of moderate-intensity continuous training. The most important results of this study were that high-intensity interval training developed aerobic capacity to a similar degree as moderate-intensity continuous training, with an increase in anaerobic capacity

1- Introduction and the importance of the research

Sports training today is a constantly evolving science, always seeking development, modernity, and the use of the best methods and means to help achieve the best desired results with the least effort. This is achieved by utilizing research, sources, and training methods. Here, the researcher utilized modern training methods and a new training approach called Tabata training. This training approach aims to utilize a type of high-intensity and high-density exercise to achieve the maximum capacity for large muscle work in the shortest possible time. Furthermore, the use of this type of exercise may expose muscles to strain and muscle tears, which can sometimes expose a person to serious injuries. Therefore, these exercises are divided into aerobic and anaerobic exercises. Since the researcher is working with an advanced group of players, the researcher used a set of high-intensity and high-density anaerobic exercises to measure the extent of the impact of these players on the research variables under study. The researchers used a type of high-intensity interval training (HIIT), which involves exercising for short periods, followed by a rest period, and then resuming the exercise to improve muscular endurance. The idea behind these exercises is to push the body to require greater amounts of oxygen during fast-paced exercises that target anaerobic loads specific to physiological variables, which improves heart performance and lactic acid tolerance.

1-2 Research Problem:

Basketball requires continuous, advanced training due to the many variables involved during a game. Therefore, we find that a basketball player requires a certain level of muscular endurance, lactic acid tolerance, and heart rate. Therefore, developing and standardizing training programs in this direction is essential to serve both the effectiveness and the players.

The researchers therefore sought to explore this experiment in order to develop a training program that would achieve realistic results that would serve the effectiveness and help players achieve good results during matches by developing muscular endurance, lactic acid tolerance, and improving their heart rates. They also sought to achieve somewhat realistic results for generalization.

1-3 Research Objectives

1- Develop a training program for muscular endurance and some physiological variables for basketball players.

2- Identify the effect of the training program on muscular endurance and some physiological variables for basketball players.

1-4 Research Hypotheses:

There is a statistically significant effect of the training program on muscular endurance and some physiological variables for basketball players.

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1-5 Research Areas

1- Spatial scope: The hall of the National Center for the Care of Sports Talent in Diwaniyah.
2- Temporal scope: From May 5, 2024 to June 8, 2024.
3- Human scope: Basketball players at the National Center for the Care of Sports Talent in Diwaniyah.

T	Statistics	Experimental Group	Coefficient of Variation	Skewness	Significance
	Variables	X	SD		
1	Height	177.60	2.373	0.246	Homogeneous
2	Weight	72.73	3.215	0.345	Homogeneous
3	Age	27.76	3.434	0.282	Homogeneous

-3 Research variables studied:

(muscular endurance, lactic acid tolerance, heart rate).

2-4 Methods, Devices, and Tools Used in the Research:

The researcher used a number of auxiliary devices and tools to obtain the required data, as follows:
1- Whistle
2- Stopwatch
3- Scale to measure height
4- Training hall
5- Computer
6- Scale to measure players' weights
7- Training tapes
8- Basketballs
9- Training indicators
10 lactate measuring sticks

2-5 Field Research Procedures:

2-5-1 Pre-measurements (before implementing the training program):

The researchers conducted the pre-measurements on Monday, May 6, 2024, in the indoor sports hall of the National Center for Talented Sports in Diwaniyah. The researchers explained and clarified the methodology of this research and provided some advice on how to apply the curriculum components to avoid errors that could affect the progress of the training program, achieving realistic results, and encouraging players to implement them to the best of their ability and avoiding the laziness that may accompany the program's implementation.

2-5-2 Implementation of the training program prepared by the researcher:

The researchers implemented physical exercises on the research sample for one month, at a rate of four training units per week, starting from May 7, 2024, until May 9, 2024. The researchers explained the training program to their research sample, the purpose of each physical exercise, and how it served the research objectives set forth in this study. The training unit was 60 minutes long, during which the research components

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were implemented to determine the clear impact of the training program on the studied research variables and to attempt to present concrete results for the research project.

2-5-3 Post-measurements:

After the researchers completed the training program on the research sample,

the researchers implemented the same procedures used in the pre-measurements, under the same conditions and circumstances as before.

2-6 Statistical Methods:

The researchers used SPSS to extract statistical data.

3-1 Presentation, Analysis, and Discussion of Results:

After the researchers completed their research items on the sample and completed the training program, they presented and explained the results they reached in special tables that facilitated reading and clarification of the results. They also clarified the hypotheses the researchers had proposed before implementing the training program, the feasibility and validity of these hypotheses, and their contribution to solving the research problem.

Table No. (2)

shows the arithmetic means, standard deviations, calculated t-value, and the significance of the differences in the studied variables for the high-intensity exercise group.

T	Variables	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	t-Value	Sig. Level	Statistical Significance
1	Muscular Endurance	22.21	5.41	24.42	4.19	4.467	0.042	Significant
2	Lactic Acid Tolerance	10.46	0.77	11.82	0.86	2.874	0.000	Significant
3	Heart Rate	184.00	2.75	180.00	3.53	5.612	0.000	Significant

3-2 Discussion of the Results:

From what was presented in Table 2, the researcher concluded:

1- Muscular Endurance

From Table (2), it is evident that there are statistically significant differences between the pre- and post-tests for the muscular endurance variable, in favor of the post-test. The researchers believe that this difference between the pre- and post-tests is due to the type of exercises used in the training program. This is because the training method using Tabata training has significant impacts on various physical and functional variables of the athlete, and its anaerobic physical impacts are greater than its aerobic impacts, given that Tabata training is a training exercise with relatively high training intensity.

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As for the muscular endurance variable, using the t-test for correlated samples to extract differences, significant differences were found, with a calculated value of (4.467) at a degree of freedom of (5) and a significance level of (0.05) between the pre- and post-tests, in favor of the post-test. The researchers believe that muscular endurance is the ability to perform muscular activity for an extended period without feeling fatigued. This means the ability to perform exercises repeatedly for a relatively long period of time. This depends on the type of muscle fibers involved, which reduces fatigue.

Any physical exercise has positive physical outcomes, especially if the training session tends to develop this aspect (Jabar Rahima Al-Kaabi: 2007, p. 207). The researchers attribute the significant differences to the fact that the exercises used help develop the variables under study.

2- Lactic acid tolerance:

Table (2) shows that there are statistically significant differences between the pre- and post-tests for the lactic acid tolerance variable, in favor of the post-test. The researchers believe that this difference between the pre- and post-tests is due to the exercises used in their training program, as Tabata training has significant and influential effects on the physiological level, particularly those related to the lactic acid variable. Tabata training is characterized by relatively high training intensities, enabling it to produce qualitative improvements in lactic acid tolerance.

The ability to provide energy to working muscles during training and sports competitions that last more than a minute and a half and that rely on oxygen consumption to perform their functions is a criterion for measuring physical fitness. If this rate increases, it is evidence that the person is fit (Kazem Jaber: 1999, p. 172). The need for oxygen when lactic acid is elevated and working at high intensity increases oxygen demand due to increased metabolic processes (Ammar Jassim Muslim: 2006, p. 405).

The lactic acid variable, using a t-test for correlated samples to extract differences, revealed significant differences, with a calculated value of (2.874) at a degree of freedom of (5) and a significance level of (0.05) between the pre- and post-tests, in favor of the post-test.

Lactic acid tolerance aims to develop the muscle's ability to withstand muscular performance resulting from the anaerobic energy system, the lactic acid system (Abu Al-Ala Abdel Fattah: 1999, p. 49).

3- Heart Rate:

Table (2) shows that there are statistically significant differences between the pre- and post-tests regarding the heart rate variable, in favor of the post-test. The researchers believe that this change in the two tests is due to the Tabata training they followed in their training program, particularly the heart rate variable, given that the heart rate variable is significantly and directly affected by the type and intensity of the exercises used. Since Tabata training is characterized by high training intensity, there is a clear impact on the heart rate level.

The heart rate variable, using the t-test for correlated samples to extract differences, revealed significant differences, with a calculated value of (5.612) at a degree of freedom of (5) and a significance level of (0.05) between the pre- and post-tests, in favor of the post-test. Heart rate increases immediately upon beginning training. This is related to the rate of increase in training intensity. Training intensity is determined by the ratio of oxygen consumption. As the heart rate increases, so does oxygen consumption. Heart rate increases with increasing training intensity (Bahaa El-Din Salama: 2000, p. 68).

Scientifically based, structured training results in lower resting heart rates compared to pre-training rates. This leads to functional and physiological adaptation, as physical exertion increases the volume of the heart's pumping stroke, or the amount of blood pumped by the heart with each heartbeat (Hazzaa Mohammed Al-Hazzaa: 1997, pp. 29-30).

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Heart rate increases during physical exertion because the muscles require larger quantities of oxygenated blood to supply the muscle with the energy needed for activity. Heart rate returns to normal after the end of the physical exertion (Samiah Khalil: 2021, p. 154).

4-1 Conclusions

The use of Tabata exercises has positive effects on muscular endurance and some physiological variables established by the researchers, as follows:

1- Differences existed between the pre- and post-tests of the experimental group, in favor of the post-test for the studied research variables.

2- The Tabata exercises developed by the researchers had a significant impact on the studied research variables (muscular endurance, lactic acid tolerance, heart rate).

3- Tabata exercises have a significant and clear impact on the physiological and physical variables of the athlete, given the relatively high training intensity of these exercises.

5-1 Recommendations

The researchers recommend the following:

1- The need to develop training programs specifically for Tabata exercises to develop the physiological aspect of players, given the high-intensity exercises they contain.

2- The need to develop training programs specifically for Tabata exercises to improve the physical level of players.

3. Tabata exercises require a specific level of knowledge and technique for this type of exercise. Therefore, it is necessary to develop development programs for trainers to familiarize them with this training method and its application to achieve the greatest benefit from this type of training.

4. It is necessary to conduct supporting training units alongside the basic training units (skills and physical) to further refine the athlete's physical and physiological aspects.

5. It is necessary to conduct other similar studies to further clarify this training method and achieve the desired benefits.

Appendices

Appendix No. (1) Model of weekly and daily training units

Week	Unit Order	Exercises	Training Intensity	Training Volume
First	First	10m sprint at high speed	95%	2x3
		Jump squats	80%	2x4
		20m run, return, run again	75%	3 reps
	Second	High knee step-ups	80%	2x10 reps
		Pull-up hang	85%	2x1
		10m sprint and return	95%	3 reps
	Third	20m run with 10s rest	90%	5 reps
		Sit-ups touching knees with elbows	85%	20 reps
		Push-ups	85%	25 reps
	Fourth	15m sprint back and forth	90%	4 reps

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		Plank shoulder taps	80%	25 reps
		Plank for 30s	100%	1x3 reps
Second	First	20m run and back again	80%	2 reps
		High knee step-ups	75%	3x10 reps
		15m directional sprint	95%	2 reps
	Second	Plank for 30s	100%	1x4
		Push-ups	90%	20 reps
		Plank shoulder taps	85%	20 reps
	Third	Jump squats	85%	2x3
		20m sprint with 1m rest	90%	3 reps
		10m sprint at high speed	95%	2 reps
	Fourth	Plank for 45s	95%	2x2
		Jump squats	85%	2x3
		15m sprint back and forth	95%	3 reps
Third	First	Pull-up hang	75%	2x6 reps
		10m sprint and return	90%	3 reps
		20m run with 10s rest	95%	2x2 reps
	Second	Push-ups	95%	20 reps
		Plank for 45s	85%	2x3 reps
		15m directional sprint	90%	3 reps
	Third	High knee step-ups	85%	3x10 reps
		Sit-ups touching knees with elbows	85%	25 reps
		15m sprint back and forth	90%	3 reps
	Fourth	Sit-ups touching knees with elbows	90%	20 reps
		Plank for 1 minute	95%	2 reps
		20m sprint and return	90%	3 reps
Fourth	First	10m sprint at high speed	95%	3 reps
		15m directional sprint	95%	2 reps
		Jump squats	85%	2x3 reps
	Second	Plank shoulder taps	85%	25 reps
		Plank for 1 minute	90%	2x2 reps
		Sit-ups touching knees with elbows	95%	20 reps
	Third	15m directional sprint	95%	3 reps
		Jump squats	90%	2x2 reps
		Sit-ups touching knees with elbows	95%	20 reps
	Fourth	20m run and return	85%	3 reps
		Jump squats	90%	3 reps
		Plank for 1 minute	90%	2x3 reps

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