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EFFECTS OF ENDURANCE TRAININGS ON AEROBIC PERFORMANCE IN LONG DISTANCE RUNNERS

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ABSTRACT
This study was conducted in 2019 to evaluate the effects of endurance training, especially on long-distance runners, on the endurance of these athletes. Experimental and control groups were formed in the study and the characteristics of these groups are as follows. The age range of the athletes in the group participating in the experiment was 18-22 and their number was 40 in total. The athletes in the study group were divided into 20 experimental and 20 control groups. Before and at the end of the training period, 30m sprint, Cooper test and subcutaneous fat measurements in three areas performed. And the control group was given free exercise for one day for one hour for 12 weeks. The training period was set as ''4 days in the first two weeks and 3 days in the other weeks'' for 12 weeks and the experimental group was motivated for willingness before the each studies. In the evaluation, a significant difference was found in developmentally aerobic power, 12min Cooper running, between the control and experimental groups ($P<0.01$). When we evaluated the experimental and control groups in terms of sprint test, the difference in development between them was found to be significant ($P <0.01$). The difference between the experimental group and the control group in body fat percentage was statistically significant ($P<0.05$).

Keywords: Aerobik Capacity, Endurance Training, Runner.

INTRODUCTION

When classifying durability, these are; We can group aerobic endurance and anaerobic endurance as energy production mechanisms under the names of short, medium and long-term endurance (Teyhen et al., (2014), Kilpatrick et al., (2014). When evaluated in terms of performance, endurance is an indispensable feature for success. It has a direct impact on the athlete's success in short, middle and long distance running. Endurance is the body's ability to sustain fatigue for a long time and without interruption (Sevim, 2007).

Aerobic capacity refers to the body's ability to deliver and utilize oxygen to the muscles. This capacity is measured by maximum oxygen uptake (VO2max) and is an important indicator of cardiovascular health. High aerobic capacity allows the heart and lungs to work more efficiently, which increases endurance and reduces fatigue. In addition, regular aerobic exercise supports brain health, improves cognitive function and improves mood. Factors such as genetics, age, gender and physical activity level can affect aerobic capacity. Therefore, increasing aerobic capacity is critical for overall health and quality of life. For the reasons mentioned above, aerobic capacity is important for runners.

Endurance training covers a wide range from long-term, low-intensity exercises to high-intensity interval training. These types of training increase the capacity of the cardiovascular system, optimizing the use of oxygen and energy production in the muscles. These trainings, which are applied especially to improve the performance of long-distance runners, increase aerobic endurance, increase the lactate threshold and increase the resistance of the muscles to fatigue.

Endurance training improves the aerobic capacity of long-distance runners to optimize their performance. This training increases the lactate threshold and increases the resistance of the muscles to fatigue. As a result, the runners' race performance and overall endurance are significantly improved (Demir, 1996; Kesler, 2011).

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Endurance training methods include; We can divide it into repetition method, competition method, interval method and continuity method (Çakıroğlu (2006). Endurance is defined as the ability of individuals and athletes to resist the physical and physiological fatigue they are exposed to (Sevim, 2002).

Long-distance runners are known as athletes who require high levels of aerobic capacity and endurance. Endurance training, which is applied to increase and sustain the performance of these athletes, plays a critical

role in increasing the efficiency of the aerobic system. Aerobic performance is directly related to physiological adaptations that optimize the process of transporting and using oxygen to the muscles. In this context, understanding the effects of endurance training on aerobic capacity for long-distance runners is of great importance for both coaches and athletes.

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And also, Body fat percentage is an important indicator of overall health and fitness level. Body fat percentage is the ratio of body fat to total body weight, and this ratio varies depending on a person's weight and height. Keeping body fat percentage under control for a healthy life is possible with regular exercise and a balanced diet.

Our aim in this research, which focuses on endurance training, is to observe and evaluate how the special importance of this training for the branch is shaped. While doing this, the effects of endurance training on the aerobic energy system and body composition in long-distance runners will also be examined.

METHOD

Research Design

The experimental design of this study consists of pre-test and post-test application of body fat reductions, Cooper tests, maxVO2 determination, 30 m sprint measurements to the research and control groups of long-distance runners. The training period was determined as 12 weeks and the experimental group was motivated in terms of willingness before the studies. The control group was given free exercise for one day for one hour for 12 weeks to have some train and participated in the pre-test and post-test on the announced dates.

Study Plan

The experimental group was programmed to develop the aerobic power of the athletes through endurance training for twelve weeks, 4 days in the first two weeks and 3 days in the other weeks. *B.Break: It means rest. The control group was given free physical activity in Physical Education classes for 1 hour once a week, every week for 12 weeks.

Personal Information

Personal information was noted acording to their specialities the researchers (age, Weight, Height). In addition, during the face-to-face interview, subjects was selected to experimental or control groups and those were informend in which groups at once.

Subjects

A total sample of 40 people was used in this research, and two groups of 20 people were formed as the experimental and control groups. The main characteristics of this sample of 40 people are that they are new to sports and are first-year university students. The physical parameters of the athletes are given in table

Data Collectıon Methods

The main purpose of experimental data collection methods is to test the accuracy of a certain hypothesis and to reveal cause-effect relationships. These methods are carried out by manipulating variables under controlled conditions, and thus the effects of independent variables on dependent variables are examined.

Experimental methods are usually applied in laboratory environments or in the form of controlled field studies, and thus external factors are kept to a minimum2. These methods provide high internal validity in scientific research, increasing the reliability of the results obtained and ensuring repeatability

Data collection methods are techniques and procedures used to collect data for research purposes. These methods can range from simple, feedback-providing measurements to more complex experiments.

Our study to obtain the data was conducted in 2019, and the methods of obtaining the data are given below.

Body Parameter Measurements

Body fat measurements to determine body fat percentage. Skinfold Thickness of Thigh, Subscapular, Abdominal measured by caliper tool and the resulting values were noted. Measurements were made barefoot and wearing shorts.

Cooper Test Measurements & V02 Max Measurements

Aerobic endurance (V02 max,) was calculated with the Formula (Distance(m.)- 504.9) ÷ 44.73 = VO2max) 12 min. Running distance measurements were made on a 400 m athletics track. Test participants were informed before starting. Measurements were made according to distance, taking into account the distance the participants ran during the period. The distances run by each subject participating in the study were written in meters.

5x30 m. Running Test

Measurements were made on a standard track with a weighing ground. Preliminary information about the test was given before it started. 5 repetitions were performed and the scores were noted in each athlete's own section.

Tests Used to Evaluate Endurance; The tests used to measure motoric properties were selected as tests proven reliability and accuracy and were applied in the experimental and control groups before and after the training. Measurements were made with reliable and valid tests.

Statistical *Evaluation*

The the above mentioned test values of the groups before and after training were examined. In terms of the training independent variable and the results were evaluated statistically. In this evaluation, statistical t test was used.

FINDINGS

Table 1. Initial Values Of The Subjects

	Experimental Group			Control Group		
	Age (Years)	Height (cm)	Weight (Kg)	Age (Years)	Height (cm)	Weight (Kg)
X	19.8	175.48	65.9	19.76	171.38	63.13
SS	1.66	4.47	5.61	1.72	4.36	5.76
SX	0.46	1.17	1.47	0.37	1.26	1.40[4]

Table 2. Body Fat Percentage Status Of The Groups

	Experimental Group			Control Group		
Body Fat (%)	Pre-test.	Post-test	Body-Fat reduction values (%)	Pre-test.	Post-test.	Body-Fat (%)
X	9.96	9.57*	-0.32	9.71	9.84	0.13
Ss	3.09	3.04	0.28	2.56	2.53	0.57
Sx	0.79	0.78	0.07	0.66	0.65	0.14

*$p<0.05$

Although there were no significant differences in the fat percentage measurements of the control group ($P<0.01$), a significant difference was observed in the body fat percentage after training in the experimental group. Moreover; In the tables below, the 12-minute Cooper test and 5x30 meter test results of the experimental and control groups are shown in table 4 and table 5, respectively.

Table 3. Experimental And Control Group 12 Min. Cooper Test Values

	Cooper Test			Max. VO2 ml/kg/		
Experimental group	Pre-Training	Post-Training	Development Value (m)	Pre-Training	Post-Training	Development Value (m)
Mean	269.01	303.8	348	47.11	51.13	10.48
Std. Dev	224	156.1	133.6	3.6	2.9	11.21
Std.Dev (mean)	56.42	39.90	34.32	28.43	17.32	11.16

	Cooper Test			Max. VO2 ml/kg/		
Control Group	Pre-Training	Post-Training	Development Value (m)	Pre-Training	Post-Training	Development Value (m)
Mean	2587	2689	102	46.21	46.54	3.29
Std. Dev	146.3	146,79	62,65	9.2	14.7	24.23
Std.Dev (mean)	38.33	38.41	17,22	29.78	25.20	8.07

**(P<0.01)

A statistically significant difference was found between the Experimental group and the Control group in the Cooper test development group average difference (P<0.01).

Table 4. Experimental and Control Group 5x30 m. Test Values

	Experimental Group			Control Group		
	Pre-Training	Post-Training	Development Value (m)	Pre-Training	Post-Training	Development Value(m)
Mean	4.75	4.54	-0.21	4.84	4.73	-.0.12
Std.Dev	0.27	0.16	0.16	0.21	0.25	0.11
Std.Dev (mean)	0.07	0.05	0.03	0.06	0.07	0.02

**(P<0.01).

There was a statistically significant difference between the 5x30 m running test results of the Experimental Group and the Control group. (P<0.01)..

CONCLUSION and DISCUSSION

Improving endurance is a complicated situation where many factors are involved, such as the scope, duration and frequency of the studies. It is one of the main motoric features that create success on the field. In this study, endurance development was evaluated scientifically and tried to be supported by associating it with some feedback. The experimental group training applied in the study is similar to the studies done in the literature.

As a result of investigating the effects of different endurance exercises on the maximal oxygen capacities of professional football players; The positive effects of two different endurance trainings, continuous running and variable tempo running, on the aerobic capacity and respiratory data of football players were observed for 6 weeks (Kesler, 2011).

A positive effect was observed on the aerobic capacities of football players in the 14-16 age group who exercised with the intense interval training method (Altın & Kaya, 2012).

As a result of the study on body composition and aerobic capacity of training with continuous and interval running method; The effect of continuous running training in reducing body weight and the effect of the two training methods mentioned in reducing body fat rate and improving aerobic performance has been mentioned (Revan et al., 2008).

In the research conducted on serum hormones, blood lipids and fat ratio in different aerobic training exercises; As a result of the high metabolism that occurred during the prepared program, significant decreases were detected in the body fat rates of the subjects participating in the study within the training program (Tamer, 1996).

As a result of examining the effect of anaerobic interval training performed at different rest intervals and at the same intensity on aerobic and anaerobic capacity and blood parameters; It has been observed that the aerobic and anaerobic capacity of the subjects doing interval training improved and an increase or decrease in some blood values was detected (Demiriz, et. al. 2015)

Aerobic capacity and anaerobic capacity support each other, that is, by improving aerobic capacity, we also improve anaerobic capacity. The reason for this is that it can maintain performance for a longer period of time without going into O2 debt and can recover more quickly after borrowing. This view is supported by the close relationship between the 5x30 sprint test and aerobic capacity (Carrera & Bompa (2007).

In this study, 12 weeks of endurance training was performed and a statistically significant difference was observed as a result of the 12-minute Cooper test performed for comparison at the end of these 12 weeks ($P < 0.01$). There is also a significant difference in the 5x30 test, which is also applied as a sprint test ($P<0.01$).

When body fat percentage was evaluated at the end of 12 weeks, results similar to other studies in the field were obtained and the decrease was found to be statistically significant ($P<0.05$). In addition, aerobic performance showed an extremely significant difference (10.92%) versus (3.32) of the control group ($P<0.01$).

As a result: As a result of the twelve-minute Cooper test, it is statistically significant in terms of pre-test and post-test ($p <0.01$). The increase in aerobic power (max.VO2) in the groups is statistically significant ($p<0.01$).

There was a statistically significant difference between the 5x30 m running test results of the Experimental Group and the Control group ($P<0.01$).

When we look at the situation in body fat percentage, there was a significant decrease only in the experimental group before and after training ($P<0.01$).

The significant improvement in the control group despite training for 1 hour, 1 day a week can be explained by several scientific factors; Natural Adaptation and Daily Activity: The human body can naturally adapt due to daily life activities and environmental factors. These adaptations can lead to small but significant improvements in some physical parameters such as muscle strength and endurance.

Placebo Effect: Individuals in the control group may tend to feel better because they are aware that they are participating in a study. This psychological state can lead to improvements in their performance and the measured parameters.

Nutrition and Lifestyle: The eating habits, sleep patterns and general lifestyles of individuals in the control group can affect their physical performance. For example, better nutrition or more rest can lead to improvements in physical parameters.

Measurement Errors: The measuring devices and methods used in the studies may have a certain margin of error. This margin of error can lead to results that appear to be significant improvements in the performance of individuals in the control group.

SUGGESTIONS

Significant results were found in our study and future studies may benefit from different methods and research topics as listed below.

Comparison of Different Training Models: Studies can be conducted comparing the effects of different endurance training models (e.g., interval training, tempo runs, long-distance runs) on aerobic performance. This can help determine which training model is more effective.

Examination of Genetic Factors: Studies can be conducted examining the effects of genetic factors on endurance training and aerobic performance. This can help understand how individual differences affect training responses.

Long-Term Effects: Studies can be conducted examining the effects of long-term endurance training (e.g., training programs that last for years) on aerobic performance. This may help understand the lasting effects of training and its role in the aging process. Use of Technological Aids: Studies examining the effects of wearable technology (e.g., heart rate monitors, GPS devices) on endurance training and aerobic performance could be conducted. This could show how technology can improve training efficiency.

Significant results were found in our study and it is suggested that different training and study groups can be used in future studies as listed below.

High Intensity Interval Training (HIIT): Studies can be conducted to examine the effects of HIIT training to increase aerobic capacity in long-distance runners. Such training can increase endurance with short-term high-intensity exercises.

Fartlek Training: Studies can be conducted to investigate the effects of fartlek training (speed games) on the aerobic performance of long-distance runners. This type of training can increase the endurance and speed of runners with changes in speed and distance.

Hill Training: Studies can be conducted to examine the effects of uphill running on aerobic performance. Hill training can strengthen leg muscles and increase cardiovascular endurance at the same time.

Long Distance Running: Studies can be conducted to examine the effects of traditional long-distance running (e.g., 20 km and above) on aerobic capacity. This can improve runners' endurance and energy management.

Training Intensity and Duration: Studies can be conducted to compare the effects of different training intensities and durations (e.g., low-intensity long-duration runs vs. high-intensity short-duration runs) on aerobic performance.

ETHICAL TEXT

Participants' confidentiality and protection of personal data were taken into consideration in the study. The study was conducted in accordance with scientific ethical rules. In this article, the journal's writing rules, publication principles, research and publication ethics rules and journal ethics rules were followed. The responsibility for any violations that may occur regarding the article belongs to the authors. Data for this study were collected in 2019.

The contribution rate of the first author to this study is 60% and the contribution rate of the second author is 40%.

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