

Effect of Training Program for Speed Endurance Development on Serum Beta-Endorphin, Lactic Acid, Lactate Dehydrogenase Enzyme and Numerical Achievement Level of 1500 m Running Female Competitors

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Abstract: The research aimed at putting a suggested training program for developing the speed endurance and examining its effect on some biochemical variables (beta-endorphin, lactic acid and lactate dehydrogenase enzyme (LDH)) and the numerical achievement level of the 1500m running female competitors. The researcher used the experimental method via the experimental design of one group with pre and post measurements. The research community included 10 female players for 1500 m running competition who represented Gharbia athletic team. Results showed that the suggested training program for developing the speed endurance affects positively with statistical significance on the biochemical variables (beta-endorphin, lactic acid and LDH) and affects positively on the numerical achievement level of the 1500 m running female competitors. The researcher concluded that the suggested training program improve the numerical achievement of 1500 m running female competitors through the positive effect on lactic acid production and LDH response with decreasing beta- endorphin concentration in blood which indicates reduction of the stressful effect of 1500m running.

Key words: Speed endurance % Beta-endorphins % Lactic acid % Lactate dehydrogenase enzyme % LDH % Numerical achievement level

INTRODUCTION

Fatigue is a complex phenomenon that can be described as a time dependent exercise-induced reduction in the maximal force generating capacity of a muscle [1]. The muscular fatigue is one of the most important problems affecting the performance level of the player and it is a multifaceted phenomenon, as there are different types of muscle work there are different types of muscular fatigue [2]. Muscle fatigue caused by muscle work hard differs from the quality of muscle fatigue resulting from the action moving, as well as the different degree of fatigue is according to different muscle work and the period of a spiral [3].

Speed endurance is the ability to continue to perform movements symmetric and asymmetric and replicated efficiently and effectively for long periods at high speeds without a drop in the level of efficient performance [4].

Lactate dehydrogenase enzyme (LDH) helps in getting rid of lactic acid. The increase in the concentration of this enzyme is accompanied by an increase in the elimination of lactic acid where it disputed the hydrogen

and thus converts lactic acid to pyruvic acid. In addition, beta-endorphin (blood morphine) is a hormone produced by the pituitary gland and works to reduce pain and tension and works chemical carrier and enter in many physiological processes such as temperature regulation of the body and regulates blood pressure and helps in increasing the secretion of some hormones such as glucagon and insulin. Excretion increases with stress, anxiety and fatigue [5-9].

The middle distances competitions are considered as a connecting link between the sprint competitions and long distances running competitions (800 m and 1500 m competitions). In fact, we cannot put a borderline between the sprint and the middle distances running, for example the competitors of the 800m can participate in the 400m competition, on condition that they should be fast. Also, the participation of the middle distances players especially 1500 m can participate in the long distances competitions, on the condition that they should be characterized with the endurance [10]. So, the ideal female middle distances player is the one who combines the speed running and the endurance of the long distances.

The research problem rose when the researcher noticed the fall of the numeric achievement level of the female competitors in the 1500 m running competition of Gharbia area which is a very serious problem and needs scientific solutions for it via putting rationalized training programs.

However, the best achieved numeric level of the female competitors in Gharbia in the 1500m running competition was 5.30.11 min, while the Egyptian number is 4.43.93 min. So, here appears the great difference between the numeric achievement level of Gharbia female competitors and the numeric level of the republic female champion. From here, the research tried to put a training program for developing the speed endurance and identifying its effect on some of the biochemical variables including beta- endorphin, lactic acid and lactate dehydrogenase enzyme (LDH), as well as the level of numeric achievement of the female competitors of 1500m running.

Research Objectives: This research aims at putting a suggested training program for developing the speed endurance and identifying its effect on:

The biochemical variables (beta- endorphin, lactic acid and lactate dehydrogenase enzyme (LDH)) of the female competitors of 1500 m running.

The level of numerical achievement of the female competitors of 1500 m running.

MATERIALS AND METHODS

Study Design: The researcher used the experimental method via the experimental design of one group with pre and post measurements.

Research Community: The research community included 10 female players of 1500 m running competition who represented Gharbia athletic team.

Research Sample: The research sample were chosen in the intentional method by the middle distances female competitors in Gharbia athletic team, They were 10 female players representing the following sports institutes: Tanta Sports Club - Kohafa Club - Gharbia Youth Club - El Santa Youth Center - El Manshia El Kobra Club in Gharbia and they are registered in the Egyptian Athletics Federation.

Methods

Biochemical Measurements: Blood samples were taken from each participant before and after the application of the training program. All samples were analyzed by doctor specializing in medical tests for the estimation of serum beta- endorphin, lactic acid and lactate Dehydrogenase enzyme (LDH).

The Physical Test: Shuttle run test (25m x8) [11].

Measuring the Numerical Achievement Level of 1500 m Running Competition: The researcher had used a running test (1500 m) for measuring the numerical achievement level for the members of the research sample. The time is recorded for the nearest 1 /100 of the seconds, with the use of three arbitrators of track and field testing.

The Bases of Putting the Suggested Training Program: The researcher studied some scientific specialized references in the track and field to identify some of the scientific foundations that was taken into account in developing the training program as follows:

- C The program content suits the abilities of the research sample members.
- C The break and activity periods are organized in the program.
- C The periodic training method was used in its two types (low intensity and high intensity).
- C The fluctuation method 2:1, 3: 1 were used, meaning that high load for two days is followed by high load for one day or positive break and three days of high load are followed with low load or positive break.
- C The load intensity in the suggested training program ranged from 60 % to 90 % of the maximum speed of the player.
- C Repetitions ranged between 2: 3 repeat.
- C Groups were of 3:4 sets.
- C Rest between the repetitions was from 2 to 8 min.
- C Rest between the groups was from 10 to15 min.
- C Distances performance was from 50m to 150m, with higher intensity than the competition intensity for the speed training.
- C Distances performance ranged from 200m to 1500m, with the competition speed for developing the speed endurance at the 1500 m running female competitors.

Running Exercises Used During the Program:

- C A distance of 200 m run and running speed 14-18 seconds and rest periods, intra 90-120 seconds and the number of repetitions 6-8.
- C 3x150 m increase in speed (50 m, 50 m and 50 m) and 3 minutes rest time.
- C 3x400 m and running speed 52-54 seconds and rest periods, intra-5 minutes and the number of repetitions 4-6.
- C 3x 120m increasing speed of time (3 minutes rest).
- C 3x 400m and running speed 75-95 seconds and rest periods, intra 180-300 seconds and the number of repetitions 4-5.
- C 3x60 m run top speed (rest 2 minutes).
- C 1x 800m run top speed from the beginning of higher.
- C 2x 100m run top speed from the beginning of higher.
- C 2x 1500 meter run intermittently as follows (800-meter run - 75% of the maximum level of the player, 500-meter run - 75% of the maximum level of player, 200-meter run -75% of the maximum level of player.
- C Taken into account during the program that the rest will be the positive use of exercises such as walking or relaxation exercises.
- C 1000 meters and relaxation exercises - 1500meters and relaxation exercises.

Time Distribution of the Training Program: The total period time of the program is 8 weeks. There are 4 units a week. Time of training unit daily is 120 minutes, the total duration of the program is 64 hours.

Statistical Treatments: Mean, Standard Deviation, T. Test. changes%. The Researcher had used the 0.05 level as a limit for the significance.

RESULTS AND DISCUSSION

Table 1 shows statistical significance differences at 0.05 level between the pre and post measurements of the biochemical variables (beta-endorphin, lactic acid and LDH).

Table 2 shows changes% between pre and post- measurements in the biochemical variables (beta-endorphin, lactic acid and LDH). The highest % changes was 20.37 % of LDH, while the least was 14.47 % of beta-endorphin.

Table 3 shows statistical significance at 0.05 level between the pre and post-measurements of the Speed Endurance, numerical achievement level of 1500m running female competitors.

Table 4 shows changes% in the speed endurance, numerical achievement level of 1500m running female competitors between pre and post- measurements.

Table 1: Differences of the biochemical variables between pre and post Measurements (N = 10)

Statement		Pre-measurement		Post-measurement		Differencebetween the two means	T test
Variables	Measurement Unit	±M	SD	±M	SD		
Beta - Endorphins	Pico mole / liter	±9.97	0.18	±8.71	0.23	1.26	9.58*
Lactic acid	Mmol / liter	±6.81	0.09	±5.83	0.11	0.98	7.34*
LDH	Unit Miter	±599.14	25.3 2	±497.7 6	23.94	101.38	10.12

Table T value at 0.05 level = 2.262 * significant at 0.05 level

Table 2: Changes% in the biochemical variables between the pre and post- measurements

Statement		Research sample members N = 10		
Variables	Measurement Unit	Pre	Post	Changes %
Beta - Endorphins	Pico mole / liter	9.97	8.71	14.47 %
Lactic acid	Mmol/ liter	6.81	5.83	16.81 %
LDH	Unit / liter	599.14	1497.76	20.37 %

Table 3: Differences of speed endurance, the numerical achievement level in 1500 m running competition between the pre and post- measurements (N=10)

Statement		Pre-measurement		Post-measurement		Differencebetween the two means	T test
Variables	Measurement Unit	±M	SD	±M	SD		
Speed Endurance	Second	±43.67	1.44	±40.40	1.05	3.27	4.37*
Numerical level ofthe 1500 m running	Minute	±6.44	0.46	±5.79	0.37	0.65	3.29*

Table T value at 0.05 level = 2.262 * significant at 0.05 level

Table 4: Changes% in the speed endurance, numerical level of 1500m running competition between pre and post- measurements

Statement		Research sample members N = 10		
Variables	Measurement Unit	Pre	Post	Changes %
Speed Endurance	Second	43.67	40.40	8.1%
Numerical level of 1500 m running	Minute	6.44	5.79	11.23%

DISCUSSION

Results of Table 1 show statistical significance improvement of the biochemical variables (beta-endorphin, lactic acid and LDH). The researcher attributes the decrease of beta-endorphin concentration rate in blood to the positive effect of the training program which improved the speed endurance that helped in the retardation of the fatigue symptoms appearance on the competitors. This result agrees with results of prior studies [8, 12] as they stated that beta-endorphin secretion decreases as a result of fatigue, tension and stress. Moreover, Table 1 shows statistical significant differences at 0.05 level between the pre and post- measurements of the research sample members in the concentration of lactic acid in blood for the post- measurement.

The researcher attributes this progress in the ability of disposing lactic acid to the improvement of the training status of the research sample members and accordingly the improvement of the functional status that positively affected the decrease in lactic acid accumulation in the blood plus the increase of LDH efficiency which transforms lactic acid to pyruvic acid and that gives the player the ability to resist the muscular fatigue. This result agrees with results of previous studies [13-19] as they stated that the training programs lead to improvement of the functional status of the players. So, their ability to dispose lactic acid in the blood increases. Also, this result agrees with Sawka *et al.* [20] that the decrease of lactic acid concentration in the blood indicates the improvement of the athletes' functional status and their ability to continue the physical performance.

Table 1 shows statistical significant differences at 0.05 level between the pre and post- measurements of the research sample members in lactate dehydrogenase enzyme (LDH). The researcher attributes the decrease of LDH enzyme concentration rate in blood to the decrease of lactic acid concentration as a result of the progress in the female competitor endurance and her ability to dispose lactic acid, accordingly lactate dehydrogenase enzyme (LDH). Secretion decreases is a result of the physical adaptation and the well speed endurance.

However, upon considering Table 2, their different changes % between pre and post- measurements in the biochemical variables (beta-endorphin, lactic acid and LDH) that the highest changes % of LDH enzyme was 20.37%, while the least changes % of beta-endorphin was 14.47%. The researcher attributes this progress in the post measurements in the biochemical variables to the increase of the speed endurance at the female competitors and that helped in increasing their ability to dispose lactic acid by the help of LDH enzyme and the decrease of beta-endorphin secretion. This result agrees with other studies [21, 22], they stated that continuous anaerobic endurance development of the player improves his ability to dispose lactic acid and decrease lactic acid, beta-endorphin and LDH secretion.

The results of Table 3 show that there are differences with statistical significance at 0.05 level between the pre and post- measurements of the research sample members in the Speed Endurance, numerical level of 1500 m running for the post- measurement. The researcher attributes this progress in the speed endurance, numerical achievement level in 1500 m running to the efficiency of the suggested training program in improving the speed and that gave the female competitors the ability to endure the fatigue and the fast disposal of the metabolism lefts (lactic acid) and that in turn improves the numerical achievement level of 1500m running female competitors. This result agree with results of previous studies [11, 13-16, 19, 23] that the development of the speed endurance affects positively the numerical achievement level in the swimming, long and short distances and athletics. Also, the result agrees with Mohamed [24] who stated that lactic acid concentration in blood after the efforts indicates the functional status of the player and his ability to continue performance.

The results of Table 4 show that there is high progress in the post- measurement of the speed endurance and numerical achievement level of 1500m running that the progress ratio reached 8.1% and 11.23%, respectively. The researcher attributes this result to the advancement of speed endurance at the research sample members which had positively affected the numerical level of 1500 m running. This result agrees

with Abu El- Ella [25], he indicated that the progress in the player ability to endure increases his ability to dispose lactic acid and accordingly retards the appearance of the fatigue symptoms and so, improves the muscular action.

CONCLUSION

The suggested training program for the speed endurance development improves the numerical achievement of 1500m running female competitors which reached 11.23% through the positive effect on lactic acid production and LDH response with decreasing beta-endorphin concentration in blood which indicates reduction of the stressful effect of 1500m running.

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