

## EFFECT TRAINING PROGRAM OF SPEED ENDURANCE DEVELOPMENT ON SERUM BETA ENDORPHINS, LACTIC ACID, LACTATE DEHYDROGENASE ENZYME AND NUMERICAL ACHIEVEMENT LEVEL AT FEMALE COMPETITORS OF 1500 M. RUNNING

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### Abstract:

**Purpose.** The research aimed at putting a suggested training program for developing the speed endurance and examining its effect on some biochemical variables (Beta-Endorphins - Lactic acid - Lactate Dehydrogenase Enzyme (LDH)) and the numerical achievement level of the ( 1500m. ) running female competitors.

**Methods.** The researcher had used the experimental method via the experimental design of one group by the use of the pre and post measurements, the research community included (10) female players for (1500 m.) running competition who represented Gharbia athletics team.

**Results.** The suggested training program for developing the speed endurance affects positively and with statistical significance on the biochemical variables (Beta-Endorphins - Lactic acid. - LDH) and affects positively on the numerical achievement level of the ( 1500 m.) running female competitors.

**Conclusions.** 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 decrease Beta Endorphins blood concentration which indicate reduction of the stressful affect (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.

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. (D. Dill & W. Adams, 1980)

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 according to different muscle work and the period of a spiral (M.L. Schillings, W. Hoefsloot, and D.F. Stegeman , 2003)

Indicates (A., Abu El Ala , R., Nasser al din, 2003) to 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 .

Lactate Dehydrogenase Enzyme (LDH) helps in getting rid of Lactic acid, and increase the concentration of this enzyme accompanied by an increase in the elimination of lactic acid where it disputed the hydrogen and thus converts lactic acid to Berovic acid. In addition, Beta-Endorphins (Morphine blood) 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 , regulate blood pressure and helps increase the secretion of some hormones such as glucagon and insulin and increased excretion with stress, anxiety and fatigue (F. Gold et al. ,1995 , I. Bahaa El Din, 2000, R. Robergs, S. Roberts, 2000, W. Meyer, et al., 2001, and D. Ormard, 2002)

The middle distances competitions are considered as a connecting link between the sprint competitions and long distances running competitions in the (800 m, 1500 m) competitions. In fact, we can't 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, and also the participation of the middle distances players, especially (1500m.) , in the long distances competitions, on the condition that, they should be characterized with the endurance. ( G .Eiwes , 1997 ).

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 raised when the researcher had noticed the fall of the numeric achievement level in the (1500 m) running competition at the female competitors of Gharbia area which is a very serious problem and we should find scientific solutions for it via putting rationalized training programs.

However, by considering the best achieved numeric level of the female competitors

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in Gharbia in. the (1500m.) running competition, then, it will be (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 problem appears when the researcher tries to put a training program for developing the speed endurance and identifying its effect on some of the biochemical variables Beta Endorphins - Lactic Acid - Lactate Dehydrogenas Enzyme (LDH) and 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:

- 1- The biochemical variables (Beta Endorphins -Lactic Acid- Lactate Dehydrogenas Enzyme (LDH) ) of the female competitors of (1500 m.) running.
- 2- The level of numerical achievement of the female competitors (1500 m.) running.

#### Materials and methods

##### • Study design:

The researcher had used the experimental method via the experimental design of one group by the use of the pre and post measurements.

##### • Research Community:

The research community included (10) female players for (1500 m.) running competition who represented Gharbia athletics team.

##### • Research Sample:

The research sample were chosen in the intentional method by the middle distances female competitors in Gharbia athletics 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 are registered in the Egyptian Athletics Federation in the season 2009/2010 .

#### 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 Dehydrogenas Enzyme ( LDH ).

##### The physical test:

Shuttle run test (25m.x8)

( Y., Ahmed, Y., Samer , 2008 )

##### 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 research sample and the time is recorded for the nearest 1 /100 of the seconds , Was the use of three arbitrators to track and field for testing .

#### The Bases of putting the suggested training program:

Through studying the researcher to some scientific specialized references in the track and field has been to identify some of the scientific foundations that must be taken into account in developing the training program as follows:

- The program content should suit the program and the abilities of the research sample members.
- The break and activity periods should be organized in the program.
- The periodic training method should be used in its two types (low intensity - high intensity) .
- The fluctuation method should be used (2:1) , ( 3: 1 ). Meaning that, high load for two days followed with high load for one day or positive break, and three days of high load followed with low load or positive break.
- The load intensity in the suggested training program had ranged from 60 %: 90 % from the maximum speed of the player.
- Repetitions ranging between (2: 3) repeat.
- Groups (3:4) sets.
- Rest between the repetitions from 2 to 8 min.
- Rest between the groups from 10- 15 min.
- Distances performance from 50m. - 150m. with higher intensity than the competition intensity for the speed training.
- Distances performance ranges from 200m. - 1500m. with the competition speed for developing the speed endurance at the (1500 m.) running female competitors.

#### Running exercises used during the program:

- 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
- 3x150 m. increase in speed (50 m, 50 m, 50 m) and 3 minutes rest time
- 3x400 m. and running speed 52-54 seconds and rest periods, intra-5 minutes and the number of repetitions 4-6

- 3x 120m. the increasing speed of time (3 minutes rest)
- 3x 400m. and running speed 75-95 seconds and rest periods, intra 180-300 seconds and the number of repetitions 4-5
- 3x60 m. run top speed (rest 2 minutes)
- 1x 800m. run top speed from the beginning of higher
- 2x 100m. run top speed from the beginning of higher
- 2x 1500 meter run intermittently as follows (800-meter run - 75% of the maximum level of player, 500-meter run - 75% of the maximum level of player, 200-meter run -75% of the maximum level of player
- taken into account during the program that the rest will be the positive use of exercises such as walking or relaxation exercises
- 1000meters Dhadha and relaxation exercises -
- 1500meters Dhadha and relaxation exercises

### The Time Distribution of the training Program:

- The total period time of the program is (8) weeks. There are (4) units a week .Time and training unit daily (120) minutes, the total duration of the program (64) hours.

### The Statistical Treatments:

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

### Results:

(Table 1) Differences of the biochemical variables between pre and post Measurements

N = 10

Variables	Statement	Measurement Unit	Pre- Measurement		Post -Measurement		The Difference between the two means	T test
			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

T. value in the table at 0.05 level = 2.262 \* significant at 0.05 level

Table (1) shows statistical significance differences at 0.05 level between the pre and post measurements of the biochemical variables (Beta-. Endorphins - Lactic acid - LDH).

(Table 2) changes% in the biochemical variables between the pre and post measurements

Variables	Statement	Measurement Unit	Research Sample Members N = 10		
			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 (2) shows changes% between pre and post measurements in the biochemical variables (Beta-Endorphins - Lactic acid - LDH) that, the highest % changes was 20.37 %, of LDH while, the least was 14.47 % of Beta-Endorphins

(Table 3) Differences of Speed Endurance, the numerical achievement level in (1500 m.) running competition between the pre and post measurements

N = 10

Variables	Statement	Measurement Unit	Pre -		Post -		The Difference between the two means	T test
			M ±	SD	M ±	SD		
Speed Endurance		Second	43.67±	0.44	42.40±	1.05	1,27	5.37*
numerical level of (1500 m.)running		Minute	6.44±	0.46	5.79±	0.37	0.65	3.29*

T. value in the table at 0.05 level = 2.262 \* significant at 0.05 level

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) changes% in the Speed Endurance, numerical level of (1500m.) running competition between pre and post measurements**

Variables	Statement	Measurement Unit	Research Sample Members N = 10		
			Pre	Post	Changes %
Speed Endurance numerical level of (1500 m.) running		Second	43.67	42.40	3%
		Minute	6.44	5.79	11.23 %

Table (4) shows changes% in the Speed Endurance, numerical achievement level of (1500m.) running female competitors between pre and post measurements.

#### Discussion:

The results of table (1) show statistical significance improvement of the biochemical variables (Beta-Endorphins - Lactic acid - LDH).

The researcher attributes the decrease of Beta-Endorphins 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. With training this result agrees with the study results of (P.Angelo ,2001 and W. Meyer, et al. 2001) they stated that Beta- Endorphins secretion, which is related to fatigue, tension and stress, decreases. Moreover, table (1) shows differences with statistical significance at 0.05 level between the pre and post measurements of the research sample members in the concentration of Lactic acid in blood and for the post measurement.

The researcher attributes this progress in the ability of disposing Lactic acid to the improvement of the training status at the research sample members, and accordingly, the improvement of the functional status, and that had positively affected the decrease Lactic acid accumulation in the blood plus the increase of LDH efficiency which transforms Lactic acid to Berovic acid and that gives the player the ability to resist the muscular fatigue. This result agrees with the study results of (A.A. Tarek , 1997, M. Wael , 1998, M. Mohamed , A .Mahmoud ,1998, M. Adel ,1999, Bently, et al., 2001, Burke, et al. ,2001 and G. Abeer , 2002) they stated that the training programs leads 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., 2004) 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 differences with statistical significance at 0.05 level between the pre and post measurements of the research sample members in Lactate Dehydrogenas 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 Dehydrogenas Enzyme

(LDH). secretion decreases 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-Endorphins - Lactic acid - LDH) that the highest changes % of LDH enzyme (20.37%) while the least changes % of Beta-Endorphins (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 ( K. Saad, 1993 and M. Salah ,1994) they stated that continuous anaerobic endurance development of the player improves his ability to dispose Lactic acid and the decrease the 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 and 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 the study results of (A.B. Laila, 1996, A.A. Tarek ,1997, M. Wael ,1998, M. Mohamed , A. Mahmoud, 1998, M. Adel ,1999 , G. Abeer ,2002 and Y., Ahmed ,Y., Samer, 2008) 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 (A. Mohamed ,2006) who stated that the 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) had shown that there are more progress in the post measurement of the Speed Endurance and numerical achievement level of

(1500m.) running that the progress ratio reached to (3%) and (11.23%). 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 (A., Abu El Ella ,1996) they 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 improve the numerical achievement of (1500m) running female competitors which reached 11.23% through the positive effect on lactic acid production and LDH response with decrease beta-endorphin blood concentration which indicate reduction of the stressful effect of (1500m) running.

### References:

- ABEER, G., 2002**, *The efficiency of two methods for forming the training load on the concentration of Lactic acid and some of the physiological and biochemical variables in short distances swimming*, Phd, Faculty of Physical Education for males, Menia University, 100- 102.
- ABU EL ELLA, A. ,1996**, *Training load and the athlete's health (the positives - risks )*. Dar el fikr Al Araby, Egypt , 35.
- ABU EL ELLA, A., NASRE EL DIN, R., 2003**, *Physiological Fitness*, Dar el fikr Al Araby,Egypt , 150 .
- ADEL, M., 1999**, *Training program in the way of the lactic endurance and its effect on some of the physiological and biochemical variables in short distances swimming*, Phd, Faculty of Physical Education for males, Menia University, 129-135.
- AHMED, Y., SAMER ,Y., 2008**, *Effect of anaerobic exercise in the evolution of strength Endurance and Speed Endurance of the young players in handball*, Journal of the Science of Physical Education University of Babylon, Volume I Issue VIII, 136-165.
- ALI ,E. B., 1994**, *Planning the sports training*, The Academic Dar El Ma'rifa, Alexandria.
- ANGELO, P., 2001**, *Beta-Endorphins and Endurance during Exercise*, Journal of Appl., Physiology.
- BAHAA EL DIN, I., 2000**, *Sports physiology and physical performance (blood lactates)*. Dar El Fekr El Araby, Cairo, 87 -110.
- BENTLEY, et al., 2001**, *The Effect of Lactic acid and Secretion in blood during exercise*, Medicine Magazine.
- BURKE, J., et al., 2001**, *Comparison of effects of Twainterred Training Programs on Lactate and Ventilatory Thresholds*, British Journal of Sports Medicine, England, Vol. 28, 207-213.
- DILL, D., ADAMS, W., 1980**, *Maximal oxygen uptake at second level and in high school champion runners*, Journal of Apple. Physiology. Vol. 55, 159.
- EIWES, G., 1997**, *Athletics between theory and application*, Dar El Fekr El Araby, Cairo, 191.
- GOLD FARB, et al., 1995**, *Response to Intensity and duration of Exercise*, Med., Science Sports, 357.
- LAILA, A.B., 1996**, *The effect of the physical effort on the trans omens enzymes and LDH for the sprint and running female players and their relation to the numerical level*, Phd, Faculty of Physical Education for females, Helwan University, 115- 117.
- MEYER W., et al., 2001**, *Effect of Endurance on Beta-Endorphins Secretion*, Journal of Science Sports, 212- 214.
- MOHAMED, A.K., 2006**, *Swimming between application and theory*, Vol. 3, Arabic Center for publishing, Zagazig, 75- 76.
- MOHAMED, M.A., MAHMOUD, A., 1998**, *The effect of an aerobic and anaerobic program on some physiological variables and the numerical level of the short distances competitions*, Zagazig University's Medical Magazine, 105- 106.
- ORMARD, D., 2002**, *Physiology the National Medical Surveys for Independent Study*, Hong Kong, 357.
- ROBERGS, R., ROBERTS, S., 2000**, *Fundamental principles of Exercise physiology for Fithness, performance and Health* , M c Graw – Hill publishers, Boston, 176.
- SAAD, K ., 1993**, *The sports and the biology principles*. Maadi Press, Cairo, 132- 135.
- SALAH, M., 1994**, *Using blood lactates measurement for the evaluation of the swimmers*, Phd,Faculty of Physical Education for females, Helwan University, 129-135.
- SAWKA, M., KNOWLION, R., MILES, P., 2004**, *Competition Blood lactate concentration in collegiate swimmers Eur.*, Journal of Appl., Physiology, Vol. 62,PP.99.
- SCHILLINGS, M.L., HOEFSLOOT, W., STEGEMAN, D.F., 2003**, *Relative contributions of central and peripheral factors to fatigue during a maximal sustained effort*. Eur. J. Applied Physiol., 562-268.
- TAREK, A.A., 1997**, *The effect of establishing the training load in the individual and compound direction on some of the biological and physical functions and the numerical level of the (800 m.) running competitors*, 280 - 319

**WAEL, M., 1998,** *A suggested program for developing the speed endurance and its effect on the aerobic threshold and the numerical achievement level of (800 m.)*

*running competitors,* Phd, Faculty of Physical Education for males, Helwan University, 43-91.