

EFFECTS OF COMBINED TRAINING PROGRAM, CONTROLLED DIET AND DRUGS ON MIDDLE-DISTANCE AMATEUR RUNNERS: A PILOT STUDY

Pietro Montesano¹, Daniele Masala², Maurizio Di Silvestro³,
Giulia Cipriani⁴, Domenico Tafuri¹ and Filomena Mazzeo^{1,5}

¹University of Naples Parthenope, Department of Motor Sciences and Wellness, Naples, Italy

²University of Magna Graecia, Dep. of Medical and Surgical Sciences, Catanzaro, Italy

³Professional coach

⁴Nutritionist, Humanitas Gavazzeni, Bergamo

⁵University of Naples Parthenope, Department of Science and Technology, Naples, Italy

Original scientific paper

Abstract

Introduction: Evidence indicates that appropriate nutrition and lifestyle, therapeutic and recovery drugs together with a developing exercise programs play an important role in promoting health and performance also in middle-distance amateur runners. Aim: The purpose of this study was to investigate the effect and the relationships between specific training program and controlled diet on the performances of a sample of middle-distance amateur runners. Methods: Twelve male recreation athletes, aged between 28-38 years old, with body weight ranging from 64-75 kg (mean 69.79 ± 5.79), were enclosed in a six-months training program (January-June 2018). A training program has to be developed monitoring the maximal aerobic speed through the Gacon test; oxidative stress were testing with DIFENILPICRILIDRAZIDE (DPPH) test and was given certain dietary parameters to the subjects. The trend of the performance times, were in relation to height (mean 172.78 ± 6.23) and body weight (mean 69.79 ± 5.79) of the amateur athletes. Results: The athletes participating in this study supported the tests of the initial and final tests and all, except subjects 2,6,7, showed significant quantifiable improvements in an average percentage of $3 \pm 0.5\%$. Significant improvements were found in endurance, activity level, sport competence, physical fitness and global physical body composition. Conclusions: The study demonstrated that six-months of combined training program and specific diet has be induced improvements significantly of the performance in run middle-distance amateur athletes. Adequate can improve the performance of athletes but it is important to select food, nutrients and drink properly, as well as the times when they should be hired.

Key words: sport, nutrition, drug, health, well-being, running.

Introduction

Middle Distance is crudely defined as an effort between 800m to 5000m in running and it is the overlap between sprinting (prolonged speed) and long distance running. It has a lot to do with athlete's sprinting ability (Bachero-Mena et al., 2017). Moreover, eight hundred meter running is an really demanding factor that requires considerable contributions from both the aerobic and anaerobic systems, due to high relative values of oxygen uptake (VO₂) and high blood lactate concentrations (above 15 mmol·L⁻¹) attained after the 800 m run (Hanon & Thomas, 2011). A small number of studies have examined the importance of different neuromuscular variables on middle-distance running (Young & Salmela, 2002) performance (Hudgins, et al., 2013) and the training program and controlled diet (Montesano & Mazzeo, 2019). To improve the performance where a milli-second difference may be a deciding factor to be winner, athletes are lured towards doping (Mazzeo et al., 2016). Many of the over-the-counter medications and other commonly used medications can lead to enhancement or reduction in the performance of the athlete, moreover nutritional supplements can be a cause of accidental doping (Motola et al., 2001). Nutrition and restorative drugs, therefore, is one of the

fundamental components for the prevention of the health and performance of an athlete with the foods that make on the one hand the fuel necessary for the production of energy and, on the other, the indispensable material for growth (Mazzeo et al., 2016; Di Onofrio et al., 2019). Nutrition ensures the organism the energy necessary for the carrying out of every vital activity (Energy function); provides all the substances necessary for the growth, restoration and maintenance of the body's structural integrity (plastic function); brings regulatory substances to all complex biochemical reactions (regulatory function) (Ashbaugh, & McGrew, 2016).

An adequate and varied diet must provide all essential nutrients in the required amounts. Moreover, requirements of essential nutrients vary with age, gender, physiological status and physical activity (Mazzeo et al., 2019). The state of health, condition of psychophysical well-being, is determined by a series of factors, biological, genetic, psychological, environmental that vary from individual to individual but which can not exclude a correct diet, an adequate lifestyle and regular physical activity, also to prevent obesity risk (Montesano & Mazzeo, 2019; Mazzeo, 2016b).

The link between sport, nutrition and integration has always been very strong and in sport a good supplementation is too often accompanied by the idea that it can improve the physical performance of a person who practices sport and therefore in addition to a structured training and recovery regime, an excellent diet can compensate the energy expenditure produced by physical activity (Mazzeo et al., 2016). For a subject who practices sport it is necessary to reintegrate, with lawful methods, the energy sources with adequate primary nutritional inputs (carbohydrates, water) and secondary (proteins, minerals, vitamins, fibers) varying the aforementioned contributions in relation to the effort (Montesano et al., 2013) required by the organism according to the sporting season and the pre-race period, during and post race as well as training days and times (Burns et al., 2014).

Pre-race nutrition is strictly linked to the type of commitment that the body will have to face; in endurance sports (marathon, cycling long distance, cross-country skiing, etc.) the goal that we are trying to pursue is to store large amounts of glycogen (Burns et al., 2004) in muscle and liver. The greater the effort, the higher the glycogen contribution will have to be. In any case, the meal before the competition must be easy to digest, with a minimum quantity of fiber to avoid gastrointestinal emptying, and must be consumed 3-4 hours before the competition. Furthermore, to keep glucose levels high, it is advisable to take 30-40 minutes before the competition, a supplement in the form of a drink (Nielsen et al., 2012).

As regards, then, those sports in which physical activity is prolonged beyond two hours, it is recommended that the athlete rehydrates his body with liquid and solid substances, to avoid dehydration as well as hypoglycaemia. The food to be consumed must be rationed in portions no higher than 50 gr. and contain mainly complex carbohydrates with minimum amounts of simple sugars (Peinado et al., 2013; Jonson et al., 2018).

In the post-race phase it is necessary to reintegrate the water reserves as well as glycogen consumed during the phase.

To replenish the former, just take a quantity of liquids equal to the lost kg plus another 50%. So if a person has lost 1 kg between before and after the competition, he will have to take 1.5 l of fluids. For all sports at a good level, agonists or amateur, any endurance activity, long lasting, requires a nutritional timing (Montesano & Tafuri, 2017) that must be scrupulously respected, both in the immediate post-workout, where the biochemistry of energy and structural recovery is at apogee, both in the rest of the day, during which the process does not stop, while developing less effervescence. Furthermore, the risk of taking high doses or supplementing (Ashbaugh & McGrew 2016) associations or consuming them for a long time can be harmful to health since these substances can cause damage to the liver, kidney and heart.

The achievement of the health-fitness objective can be achieved through an appropriate training program with coordinative and conditional skills improvement (Montesano, 2018). In particular, the attention given to subjects practicing amateur athletics activity has shown that the performances have improved by varying the training program, the diet and carrying out specific tests related to oxidative stress. The recommended activities, initially, include simple proposals, such as walking and / or jogging - running, postural control exercises (Montesano & Mazzeo, 2018), and then other more complex with personalized training programs with variables such as subjective status, time, discipline, stress, sports facilities.

Thus, the purpose of this investigation was to examine the effect and the relationships between specific training program and controlled diet in a sample middle-distance amateur runners.

Materials and Methods

Participants and Procedures

A total of twelve male recreation athletes subjects (Table 1), aged between 27-36 years old, with body weight ranging from 64-75 kg (mean 69.79 ± 5.79) (without medical disorders, e.g., metabolic, cardiac or orthopedic), were recruited for a six-months in a training program (January-June 2018).

Table 1. BMI and Antropometric data of athletes.

Athletes	Age (31 ± 0.9)	Height	Weight	BMI
1	34	178	82	25,88
2	33	171	67	22,91
3	36	174	70	23,18
4	30	182	78	23,55
5	29	170	71	24,57
6	30	177	73	23,30
7	28	180	74	22,84
8	34	175	75	24,49
9	27	178	70	22,09
10	31	173	72	24,06
11	35	184	80	23,63
12	36	168	69	24,45

A training program has to be developed monitoring through the Gacon test (Florio, 2000) the maximal aerobic speed, oxidative stress (Salonen, 2000) were tested with DIFENILPICRILIDRAZIDE (DPPH) test and also to the subjects were administration a controlled diet. The trend of the performance times, were in relation to height (mean 172.78 ± 6.23) and body weight (mean 69.79 ± 5.79) of the amateur athletes.

All participants had no history or clinical signs of cardiovascular or pulmonary diseases. Runners were not currently taking prescribed medications. (Sandip et al., 2012).

Data were collected during the competition phase of six months. A training program has to be developed monitoring through the Gacon test the maximal aerobic speed this incremental and intermittent test has its objective the determination of the maximal aerobic speed.

The test includes 45" of work and 15" of pause. The first distance, equal to 125m, is progressively increased by 6.25m, constituting a maximum of 23-24 steps, while the work and pause times remain unaltered.

The test is interrupted, with the detection of the last distance, when an athlete cannot travel twice the distance programmed in 45". The oxidative stress was testing with DIFENILPICRILIDRAZIDE (DPPH) test.

To the subjects evaluates oxidative stress by highlighting the body's ability to defend itself to neutralize and eliminate various reactive oxygen species and free radicals. The detection of DPPH is performed on saliva samples.

All measurements were made by the same technician, trained and assessed to be competent by an ISAK-Level 2 anthropometrist, following the International Society of Advancement of Kinanthropometry (ISAK) protocol. The trend of the performance times, were in relation to height (mean 172.78 ± 6.23) and body weight (mean 69.79 ± 5.79) of the amateur athletes

Dietary assessment

Food test followed by athletes in 3 days type repeated three times (one every two months) with the aid of a diary including instructions for use. Each meal (breakfast, morning snack, lunch, afternoon snack, dinner) taken at pre-established times, was noted on a card highlighting the foods consumed, the time and place of consumption, the description foods / recipes and any seasonings added (including taking any supplements).

The foods consumed have been quantified by applying standard household measures (glasses, cups, spoons), models (cans, individual packs), or with weight indications. In the literature it emerges that food consumption records that use weight estimation rather than direct weighing, if supported

by standard reference parameters, are valid, since they show sufficiently small errors (within $\pm 5-10\%$).

Training

The training was aimed at resistance to work developed in the presence of large amounts of lactate.

The activity was articulated with repeated running tests on short, medium and even long distances performed at high speeds with variable recoveries from 3 to 6 minutes for a total mileage of 2000 - 3000 meters. The alternation with the progressive and medium continuous running exercises was programmed to support the effort during repeated tests.

Initially the training was carried out in an indoor facility with the performance of 10' of slow running, 8' of mobilization exercises, 3' of breathing exercises, 12' exercises with the use of small tools and with small weights, 6' of abdominal and back exercises, 10' of stretching exercises, 8' of slow running. Subsequently the times of the exercises were reduced with small tools and the series and the repeated ones were introduced up to a session with variable times between 75 and 90 minutes.

Supplemental Materials

- Indoor plant
- Cones
- Small tools (Clavette, supports, circles, sticks)
- 1.2 and 3 kg weights
- Detection grids

Results

The results obtained from descriptive statistics represented that athletes (Table 2) participating in this study supported the tests of the initial and final tests and all, except subjects 2,6,7, showed significant quantifiable improvements in an average percentage of $3 \pm 0.5\%$.

Significant improvements were found in endurance, activity level, sport competence, physical fitness and global physical body composition (data not show).

There will be a significant positive relationship between a healthy physical activity that must be related to the health status of a subject and must be modulated and / or personalized in the presence of pathological onset.

The Gacon test is a technical test aimed at planning maximum aerobic power training under the intermittent form and this allows us to know the adaptation and maximal aerobic evolution of an athlete (Tables 3-4).

The test is also used in amateurs for the simplicity of execution and above all because no special tools are needed, it only requires a chronometer, cones and distance markers.

Table 2. DPPH test result.

Athletes	Initial	Final	Average	nmol/ml
1	0,856	0,888	0,872	0,28211
2	0,751	0,747	0,749	0,47133
3	0,649	0,684	0,667	0,509174
4	0,626	0,674	0,650	0,431193
5	0,651	0,717	0,684	0,356651
6	0,718	0,715	0,717	0,338303
7	0,725	0,724	0,725	0,569954
8	0,642	0,605	0,624	0,547018
9	0,646	0,621	0,634	0,597477
10	0,589	0,634	0,612	0,638761
11	0,604	0,583	0,594	0,443807
12	0,671	0,686	0,679	0,477064

Table 3. Initial Gacon test.

Athletes	Pulsations at rest	Pulsations MAX	Step	Last distance traveled in 45"	Lactic acid after 3 min.	V.A.M.	V O2 MAX
1	94	182	16	212,5	11,4	17	51
2	72	197	15	206,25	6,9	16,5	50
3	66	155	15	212,5	7,9	17	51
4	57	153	15	212,5	12,9	17	51
5	68	177	17	218,75	8,1	17,5	53
6	92	204	15	225	9,7	18	54
7	65	211	18	231,75	14,2	18,5	56
8	68	198	14	206,25	10,1	16,5	50
9	78	154	17	225	11,4	18	54
10	64	194	17	225	16,8	18	54
11	70	198	14	225	11,2	18	54
12	78	197	13	200	10,5	16	48

Table 4. Final Gacon test.

Athletes	Pulsations at rest	Pulsations MAX	Step	Last distance traveled in 45"	Lactic acid after 3 min.	V.A.M.	V O2 MAX
1	87	180	17	225	10,03	18	54
2	67	196	16	218,75	12,3	17,5	53
3	53	166	14*	206,25	4,7	16,5	50
4	63	185	15	225	11,9	18	54
5	67	180	17	225	6,2	18	54
6	84	205	18	231,25	11	18,5	56
7	66	205	19	237,5	18,6	19	57
8	60	188	16	218,75	10,4	17,5	53
9	78	193	18	231,25	16,7	18,5	56
10	68	172	14*	206,25	10,9	16,5	50
11	71	206	19	237,5	8,8	19	57
12	71	201	13	200	10,8	16	48

The 12 athletes supported the tests of the initial and final tests and all, except subjects 2,6,7, showed significant quantifiable improvements in an average percentage of $3 \pm 0.5\%$.

Discussion and conclusion

Prevention tends to gain a sanitary awareness through the knowledge of our body and the sanitary regulations, in order to be able to identify insurance of diseases in advance. These recommendations, which are at the basis of health protection systems, can be found since ancient times in China and Greece.

An adequate and varied diet ensures all the micro and macro-nutrients that the human body needs. Moreover, there are numerous sources that underline how an adequate diet before, during and

after training and competition can improve the performance of an athlete. This means that it is important to select food and drink properly, as well as the times when they must be hired by athletes (Wang et al., 1999; Montesano et al., 2019).

Each sporting discipline has specific characteristics related to the energy expenditure (Mascherini et al., 2015; Mazzeo, 2019) for which the amateur athlete who practices the fast middle-distance must articulate the training as a function of raising the level of aerobic threshold by making the choices of workloads in relation to the heart rate (Wong et al., 1999; Lytle et al., 2019; Montesano et al., 2013). The scan of the training phases must always respect a progressiveness of work providing the general activation, stretching, specific activity related to the performance, the organic and muscular fatigue with stretching and stroke in

surplus aimed at reducing the intensity of the loads up to at rest. The study shows that athletes practicing efforts middle-distance athletics improve performance if the training programs are also based on the administration of an adequate diet and on the calculation of oxidative stress that evaluates the amount of release of free radicals. The athletes must perform training sessions that prepare the competition and must then be able to recover the exhausted energies during the work process. During the recovery phase the disposal of lactic acid must be favored, exploiting the activity of the circulatory stream, and the reintegration of glycogen through the intake, in the two hours immediately after the competition, of 1gr of glucose per body weight and, if necessary, the controlled

use of supplements. Moreover, in elite athletes, the misuse and abuse of the abovementioned substances represents a serious health problem, as well as sports lawfulness, because the ergogenic aids can conceal doping substances present in the WADA list and are not always subject to strict controls (Mazzeo, 2016; Mazzeo et al., 2016). In agonistic competitions, in fact, the use of any drug substance prohibited by WADA is allowed only for medical reasons and only by virtue of an exemption for therapeutic purposes and therefore documented by the doctor. The anti-doping code establishes the sanctions that violators must meet, and there are many information campaigns on health risks related to the use of drugs without a real therapeutic purpose (Mazzeo et al., 2018).

References

- Ashbaugh, A., & McGrew C. (2016). The Role of Nutritional Supplements in Sports Concussion Treatment. *Curr. Sports Med. Rep*, 15(1), 16-19.
- Bachero-Mena, B., Pareja-Blanco, F., Rodríguez-Rosell, D., Yáñez-García, J.M., Mora-Custodio, R., & González-Badillo, J.J. (2017). Relationships between sprint, jumping and strength abilities, and 800 M performance in male athletes of national and international levels. *Journal of Human Kinetics*, 58(1), 187-195.
- Burns, R.D., Schiller, M.R., Merrick, M.A., & Wolf, K.N. (2004). Intercollegiate student athlete use of nutritional supplements and the role of athletic trainers and dietitians in nutrition counseling. *J Am Diet Assoc*, 104(2), 246-249.
- Di Onofrio, V., Montesano, P., & Mazzeo, F. (2019). Physical-technical conditions, coaching and nutrition: An integrated approach to promote cohesion in sports team. *Journal of human sport and exercise*, 14(4), 981-990.
- Florio, G. (2012). Le Test 45"-15", *Formamentis*.
- Hanon, C., & Thomas, C. (2011). Effects of optimal pacing strategies for 400- 800-, and 1500-m races on the VO 2 response. *Journal of Sports Sciences*, 29(9), 905-912.
- Hudgins, B., Scharfenberg, J., Triplett, N.T., & McBride, J.M. (2013). Relationship between jumping ability and running performance in events of varying distance. *Journal of Strength and Conditioning Research*, 27(3), 563-567.
- Johnson, B.D., Peinado, A.B., Ranadive, S.M., Curry, T.B., & Joyner, M.J. (2018). Effects of intravenous low-dose dopamine infusion on glucose regulation during prolonged aerobic exercise. *American Journal of Physiology - Regulatory Integrative and Comparative Physiology*, 314(1), R49-R57.
- Lytle, J.R., Kravits, D.M., Martin, S.E., Green, J.S., Crouse, S.F., & Lambert, B.S. (2019). *Medicine and science in sports and exercise*, 51(7), 1532-1537.
- Mascherini, G., Gatterer, H., Lukaski, H., et al. (2015). Changes in Hydration, body-cell mass and endurance performance of professional soccer players through a competitive season. *J Sports Med Phys Fitness*, 55(7-8), 749-755.
- Mazzeo, F. (2016). Drug abuse in elite athletes: Doping in sports. *Sport Science*, 9(2), 34-41.
- Mazzeo, F. (2016b). Current concept of obesity. *Sport Science*, 9(2), 42-48.
- Mazzeo, F., Monda, V., Santamaria, S., et al. (2018). Antidoping program: An important factor in the promotion and protection of the integrity of sport and athlete's health. *Journal of Sports Medicine and Physical Fitness*, 58(7-8), 1135-1145.
- Mazzeo, F., Santamaria, S., & Montesano, P. (2019). Gender difference, nutritional supplements and drug use in sport to enhancing performance: an Italian revision over the last decade. *Sport Mont*, 17(1), 69-73.
- Mazzeo, F., Monda, M., Messina, G., Santamaria, S., et al. (2016). Doping in Italy: An analysis of its spread in ten years. *Biology and Medicine*, 8(1)
- Mazzeo, F., Santamaria, S., Monda, V., Tafuri, D., et al. (2016). Dietary supplements use in competitive and non-competitive boxer: An exploratory study. *Biology and Medicine*, 8(4).
- Mazzeo, F. (2019). Attitude and practice of substance misuse and dietary supplements to improve performance in sport. *Journal of Substance use*, 24(6), 581-586.
- Montesano, P., & Tafuri, D. (2017). Timing and spacing concepts: performances in young basketball players. *Sport Science*, 10, 92-97.
- Montesano, P., & Mazzeo, F. (2018). Pilates Improvement the Individual Basics of Service and Smash in Volleyball. *Sport Mont*, 16(3), 25-30.

- Montesano, P., Tafuri, D., & Mazzeo, F. (2013). Improvement of the motor performance difference in athletes of wheelchair basketball. *Journal of Physical Education and Sport*, 13(3), 362-370.
- Montesano, P., Di Silvestro, M., Cipriani, G., & Mazzeo, F. (2019). Overtraining syndrome, stress and nutrition in football amateur athletes. *Journal of human sport and exercise*. 14(S4), 957-969.
- Montesano, P., & Mazzeo, F. (2019). Sports activities in obese teenagers improve social inclusion and health. *Sport Mont*, 17(1), 55-60.
- Motola, G., Russo, F., Mazzeo, F., Rinaldi, B., Capuano, A., Rossi, F., & Filippelli, A. (2001). Over-the-counter oral nonsteroidal anti-inflammatory drugs: A pharmacoepidemiologic study in southern Italy. *Advances in Therapy*, 18(5), 216-222.
- Nielsen, J., Krstrup, P., Nybo, L., et al. (2012). Skeletal muscle glycogen content and particle size of distinct subcellular localizations in the recovery period after a high-level soccer match. *Eur J Appl Physiol*, 112(10), 3559-3567.
- Peinado, A.B., Rojo-Tirado, M.A., & Benito, P.J. (2013). Sugar and exercise: Its importance in athletes. *Nutricion Hospitalaria*, 28(S4), 48-56.
- Salonen, J.T. (2000). Markers of oxidative damage and antioxidant protection: assessment of LDL oxidation. *Free Radic Res.*, 33(S1), 41-46.
- Sandip, M., Murnal, S., & Yuganthi, P. (2012). Cardiorespiratory response to aerobic exercise programs with different intensity: 20 weeks longitudinal study. *J Res Med Sci*, 17, 649-655.
- Wang, Z., Deurenberg, P., Wang, W., et al. (1999). Hydration of fat-free body mass: review and critique of a classic body-composition constant. *Am J Clin Nutr*, 69(5), 833-841.
- Young, B.W., & Salmela, J.H. (2002). Perceptions of training and deliberate practice of middle distance runners. *International Journal of Sport Psychology*, 33(2), 167-181.
-

Received: December 12, 2019

Accepted: December 24, 2019

Corresponding Author:

Filomena Mazzeo

University of Naples Parthenope,

Department of Science and Technology, Naples, Italy

E mail: filomena.mazzeo@uniparthenope.it

Acknowledgments

Authors are grateful to the coaches and athletes for the support to carry out this work.
