ANAEROBIC TRAINING AND THE PERFORMANCE OF MIDDLE DISTANCE ATHLETES AT AMHARA REGION

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ABSTRACT

Delivering appropriate anaerobic training at the right time for the right person is very essential to the improvement of the athlete's performance. The main objective of this study was to assess the effects of anaerobic training on the performance of middle distance athletes. 32 athletes were selected from different clubs and zones through purposive sampling techniques. Data, which were gathered via tests and time trails, were analyzed and interpreted with descriptive statistics and Paired t-test by using SPSS version 21. The results or the finding showed that the training plan was followed the principles of training indicated from the literature except differences in volume and intensity. The finding showed that there was a significant difference between pretest and posttests results of the performance of tests. Moreover, the results of time trial indicated that the athletes' performance were improved i.e. there was a significance difference between time trial one and two, time trial two and three. Depending on the test and time trials the athletes average performance improvements were 28%. Finally the researcher concluded that anaerobic training should have an effect on the anaerobic performance of middle distance runners.

Key words: Middle Distance, Anaerobic training, time trail, performance

INTRODUCTION

Middle distance running is one the most popular track event in athletics and it includes 800m, and 1500m. Now a day an athlete who competes in these events are highly competent and have been achieved remarkable new records during regional, continental, Olympic and world championships competition. Mackenzie (2001) clearly indicated that comparing past and present world record holders, it would appear that 800 meters and 1500 meters male athletes are most likely to peak around the age of 25 and female athletes at 27 years of age.

Most researchers and practitioners (Bale, 2007), for example, agree that the performance of an athlete for middle distance running depends on several factors including physical, physiological, metabolic, biomechanical, psychological, social, and behavioral characteristics. Of these factors training is the baseline, Coe (1997) indicated that the training for middle distance racing must be permitting the development of both strength and endurance in the skeletal muscle, especially the legs. They must be able to tolerate an intense sustained work load. It is our belief that only a combination of running plus weight and circuit training will provide adequate preparation for middle distance running maintenance.

For performance improvement middle distance running seek both aerobic and anaerobic training. Thompson (2009) found that the most important training methods for an anaerobic training is the new interval training which is a type of repetition training where the training effect occurs in the interval between the faster sections.

Many sport professional leaders believed that underlining the problem in coaching middle distance running is lack of accepting the effect of and the fundamental importance of anaerobic training for maximizing performance of middle distance athletes.

The researcher observed the Amhara Region coaches have planned to develop the performance of athletes. Even though the coaches gave more attention for the athlete physical and technical skills in the field of their training, they overlooked how and when applied anaerobic and aerobic training and their relationship for the performance increment of middle distance runner. So the purpose of this study was to assess the effect of anaerobic training on the performance of middle distance athlete in Amhara Region.

Objective of the Study

The general objective of the study was to assess the effect of anaerobic training on the performance of middle distance runner at Amhara Region.

Review of Related Literature

Anaerobic means ‘without oxygen’ and anaerobic endurance refers to the energy systems which are capable of operating without oxygen present. They allow muscles to operate using energy they already have in store. Anaerobic training of the right type which emphasizes the lactate system allows the athlete to clear and tolerate the buildup of the ‘acid’ part of lactic acid. Remember that lactic acid does not exist in the body. As soon as it is formed it separates into a

'lactate' bit and an 'acid' bit. We have seen that the acid is the 'bad guy' but the athlete can use the lactate as a fuel source (Thompson, 2009; Gordon, 2009).

Middle distance covers the 800 meters and 1500 meters track events. Mackenzie, B. (2001) clearly showed that comparing past and present world record holders it would appear that 800 meters and 1500 meters male athletes are most likely to peak around the age of 25 and female athletes at 27 years of age.

The involvement of anaerobic metabolism that results in RER values greater than 1.0 allows for use of RER as a criterion to determine whether an exercise test is truly maximal. The criterion for a true maximal test is an RER greater than 1.1 or at least 1.0, with the lower value predominating for children/adolescents and older adults (Holly, 1988; MacDougall et al., 1982, cited in, Plowman & Smith, 2011).

The aerobic endurance is the determining and performance limiting factor in endurance sports (Green, 1995 & Spriet, 1995, cited in, Striegel, 2008). This is not only true for long distance running, but also for middle distance running (Striegel, 2008). During exercise lasting between 2 and 3 minutes, the contribution from aerobic and anaerobic sources already constitutes 70% and 30% (Spriet, 1995).

The current trends of middle-distance training involved large amounts of high intensity interval training or high workloads in an anaerobic state, often referred to as speed endurance. This appears to be effective in improving middle distance running performances (Blasco-Lafarga, Montoyo-Vieco, Martinez-Navarro, Mateo-March, & Gallach, 2013).

However, current research suggests that these workouts come with a price to the athlete if not properly implemented into their training regime (Baechle & Earle, 2008; Beck, 2005; Coe, 1996).
Current trends in middle-distance training involve high emphasis in anaerobic capacity and aerobic capacity. Research indicates that using these high intensity interval workouts increases the ability to process lactate, improve pacing ability, improve activation of fast twitch muscle fibers, as well as other physiological improvements (Baechle & Earle, 2008; Beck, 2005; Blasco-Lafarga, Montoyo-Vieco, Martinez-Navarro, Mateo-March, & Gallach, 2013; O'Sullivan, 2006).

Anaerobic interval training is primarily reserved for those who are very fit and desire to increase speed, lactate threshold, and overall aerobic power. Such training usually results in greater lactic acid concentrations in exercising muscles and is accompanied by greater muscular discomfort. This can be a very intense type of training and should not be attempted by a beginning exerciser. Before you train anaerobically, always do a considerable aerobic warm up first, and stretch before and after vigorous activity **(**Mueller & Nichols, 2012).

Interval training is a great way to incorporate anaerobic exercise. It can be done with many types of exercise (for example, running, biking, or swimming). An interval is done by increasing your pace for a short period of time (for example, between 10 to 60 seconds) then having a slow recovery period that is at least 3 times as long as the interval. Learn more about basic interval training and a more advanced form known as High Intensity Interval Training (HIIT) **(**Mueller &

Nichols, 2012). Therefore, anaerobic endurance can be developed by using repetition methods of high intensity work with limited recovery.

In their review of literature Plisk and Stone (2003) concluded that periodized training programs are typically structured into macro-, meso-, and microcycles that progress from extensive to intensive workloads as well as general to special tasks. The essence of periodized program design is to skillfully combine different training methods in order to yield better results than can be achieved through exclusive or disproportionate use of any 1 of them.

In addition Ballestroes (1992) summarizes the division of training plan in to basic (general preparation phase), specific (specific preparation phase) and competition and recommended the training as follows:

Table 1. The scheme of training for middle distance at different phases of the training year plan as follows

Brief scheme of training for the middle distance			
Basic	1	20%	General conditioning –work in the gymnasium sprint drills (may be with weighted jacket), circuit training, light weight training with many repetitions, total training.
	2	40%	Aerobic training; steady runs of 12-16 Km over varied terrain
	3	10%	Extensive interval training-10-12 repetitions of 100,200,300m at moderate effort with jog recovery of 1-2 minutes.
	4	10%	Fartlek 1 hour easy running interspersed with fast shorts stretches, up and down hill runs and moderate speed longer stretches.
	5	20%	Pace endurance 3-6 sets of 1000 to 2000M at 75% effort with 4-6 minutes stretches.
Specific	1	10%	_ Hill runs: 10-15 repetitions of about 100-300M moderate slop e, active recovery either short 2-3 minutes of long 5-10 minutes.
	2	40%	- steady runs at anaerobic threshold of 8-12 Km.
	3	20%	-speed endurance: 4-6X (2-3 sets of 3-5 repetition) of 300-500M at 90% effort with recovery of 3and 9 minutes
	4	10%	-Fartlek -6-8 KM.
	5	20%	- Intensive interval training (faster than basic period).
Competition	1	30%	steady runs, fartlek or easy (regenerative) runs
	2	20%	Intensive interval, less repetitions, and faster than in previous period and in sets of 5, recovery up to 3 minutes.
	3	10%	Speed 6-8 fast repetition of 100M-150M, with recovery of 6-7 minutes.
	4	40%	Competition pace, at a shorter than race distance, 2-4 repetitions at racing pace with at least 10-15 minutes recovery.
	5	10%	Competition one per week but some time at other distance.

MATERIALS AND METHODS

This study was tried to investigate the effect of anaerobic training on the performance of middle distance athletes at Debre Markos training center, Amhara Region. To notch the objective up, valuable information was gathered from different sources, viz., tests (pretest and posttest), and time trials. 32 athletes, viz., fifteen females (46.9%) and seventeen male (53.1%) middle distance runners were the target population. The mean and standard deviation of the female athletes were 17.7 years and 1.10 where as for men 19.9 years and 1.59; the mean of weight for females and males was 46.07 kg and 61.24kg respectively; in related to height females mean height was 1.59 meters whereas males was 1.69 meters. The mean value of BMI (body mass index) for female athletes and male athletes were 18.2 kg/m^2 and 21.5 kg/m^2 correspondingly.

Table 2. Demographic Characteristics of respondents

	Frequency	Percent	Valid Percent	Cumulative Percent
Gender				
Female	15	46.9	46.9	46.9
Male	17	53.1	53.1	100.0
Total	32	100.0	100.0	
Chronological Age				
16-17 years	7	21.9	21.9	21.9
18-19 years	16	50	50	71.9
20 and above	9	28.1	28.1	100
Total	32	100.0	100.0	
Field of Specialization				
800m	16	50	50	50
1500m	12	37.5	37.5	87.5
3000m	4	12.5	12.5	100
Total	32	100.0	100.0	

The subjects were first informed about the tests by the researcher and then they were engaged in the pretest at the time of specific preparation phase of the macrocycle and the post-test at the end of the training before the competition of All Amhara Games whereas the time trials, which were held at the end of the month, was taken three times.

The researcher chose the following three test types vertical jump and standing broad jump to measure explosive power; Squat thrust to measure the general muscular endurance of the body; 35 m speed test to determine acceleration, maximum running speed; and 60 yard and 300 yard shuttle tests to determine anaerobic speed endurance.

Results of the Study

Table 3. Paired t-test results of pre and post tests of speed, power, speed endurance

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	35m sprint speed pretest	6.1103	32	.93737	.16571
	35m sprint speed post test	5.0938	32	2.39459	.42331
Pair 2	vertical jump pre-test	.2994	32	.05541	.00980
	vertical jump post test	28.8438	32	13.64553	2.41221
Pair 3	squat trust of pretest	1.7266	32	.17415	.03078
	squat trust post test	1.4812	32	.66641	.11781
Pair 4	60 yard shuttle pretest	17.1675	32	1.73841	.30731
	60yard shuttle post test	14.3369	32	6.47903	1.14534
Pair 5	300m shuttle pretest	71.2813	32	12.86464	2.27417
	300m shuttle post test	57.1250	32	27.84954	4.92315

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	35m speed pretest - post test result	1.01656	2.65236	.46888	.06028	1.97284	2.168	31	.038
Pair 2	vertical jump pre-test - post test results	-28.54438	13.63373	2.41013	-33.45986	-23.62889	-11.844	31	.000
Pair 3	squat trust pretest - post test result	.24531	.68894	.12179	-.00308	.49370	2.014	31	.053
Pair 4	60 yard shuttle pretest - post test result	2.83062	7.05067	1.24639	.28859	5.37266	2.271	31	.030
Pair 5	300m shuttle pretest - post test result	14.15625	27.19951	4.80824	4.34978	23.96272	2.944	31	.006

A paired-samples t-test was conducted to compare the results of pre-test and post test of 35m speed, vertical jump, squat trust, 60 and 300 yard shuttle tests. There was a significant difference in the scores for 35m speed pretest (M=6.1, SD=0.94) and post test (M=5.09, SD=2.39) conditions; t(32)=2.17, p = 0.005. These results suggest that post test result of speed test does have an improvement in time (N.B. since it is time 5.09 is greater than 6.1); There were significant difference in the scores for vertical jump pretest (M=0.30, SD=0.06) and post test (M=28.84, SD=13.65) conditions; t(32)=-11.84, p = 0.005; squat trust pre test(M=1.73, SD=0.17) and post test (M=1.48, SD=0.67) conditions; t(32)=2.01, p = 0.01; 60yard shuttle test pre test result (M=17.17, SD=1.74) and post test result (M=14.34, SD=6.48) conditions; t(32)=2.27, p = 0.005; and 300yard shuttle test pre test result (M=71.28, SD=12.86) and post test result (M=57.13, SD=27.85) conditions; t(32)=2.94, p = 0.005. These results suggest that all tests result in improvement.

Table 4
Improvement rates of the time trails

Descriptive Statistics

running distance		N	Minimum	Maximum	Mean	Std. Deviation
800m	Improvement rate from time trail 1 and 2	16	-43.77	48.91	8.4788	20.53403
	Improvement rate from time trail 2 and 3	16	-3.13	149.00	21.0838	38.51484
1500m	Improvement rate from time trail 1 and 2	12	-2.62	56.93	15.4450	21.90598
	Improvement rate from time trail 2 and 3	12	-114.92	49.32	-5.4833	37.43186
3000m	Improvement rate from time trail 1 and 2	4	.56	14.96	4.2525	7.13906
	Improvement rate from time trail 2 and 3	4	.53	8.49	2.7450	3.84368

Measures of central tendency were computed to summarize the data for improvement rate of time trial variables at different events. Measures of dispersion were computed to understand the variability of scores for the time variable. The improvement rate from time trail 2 and 3 of an 800m runners (N = 16) was better since the Mean increases from 8.48 to 21.10 but the variability of scores was larger as it increased from 20.53 to 38.5. in case of 1500m runners(N=12) the improvement level from time trail 2 and 3 is not better than the time trail between 1 and 2 since the mean automatically decreased from 15.45 to -5.48 on the contrary the variability increases drastically from 21.91 to 37.43. In related to 3000m runners(N=4) the improvement rate like 1500m runners decrease i.e. mean decreased from 4.25 to 2.74 and the variability of scores was

also a lit bit decreased from 7.14 to 3.84. Generally, there was a great improvement in performance was observed in 800m middle distance runners than 1500m and 3000m runners.

Discussion

The main objective of this research was to assess the effects of anaerobic training in middle distance athlete's performance. To do so, the data was collected by using deferent instruments.

Ballestroes (1992) recognized 800m requires approximately 40% anaerobic and 60% aerobic; and 1500m-3000m need 30% anaerobic and 70% aerobic. Since coaches plan trainings by considering the percentage level of aerobic and anaerobic to reach to their peaking, performance improvement was seen in the study area especially in 800m. Distances that require up to fifteen minutes to complete depend on both aerobic and anaerobic metabolism (Boileau et al 1982; Mahon et al, 1996; Houmard et al, 1994, cited in, Matome, 2007).
A paired-samples t-test was conducted to compare the results of pre-test and post test of 35m speed, vertical jump, squat trust, 60 and 300 yard shuttle tests. So, all tests result in improvement. Sharkey (1997) described improvement due to training is most dramatic when the level of fitness is low. Later, when fitness is high, long hours of effort are needed to achieve small. This is because (Martens, 2012)anaerobic fitness is earned minute by minute, day by day, as you engage in appropriate training exercises.

Due to the occurrence of injury in the study area, not all middle distance runners improve performance i.e. five athletes did not improve their performance when the researcher applied the second time trail so did seven athletes during the third time trial. Therefore, according to Smith(2003) to minimize the risk of injury, it is important to first develop a base level of aerobic running for several months before attempting some of the more challenging training methods. Then, slowly add one to two workout sessions during the week while trying to maintain the same weekly mileage. To give your body adequate time to recover, leave two or more days in between harder workouts. Generally, it is not necessary to do more than two sessions a week at a faster pace in order to see training gains.

CONCLUSION

This study shows that whether training brings performance change or not. For the purpose of this study, 32 subjects were engaged. The test results of athletes show that there was a statistically significant difference between pretest vs posttest result. Speed, 35m sprint, improved by 19% since it downs from 6.10 seconds to 5.09 seconds. Even though a great improvement in performance was observed in all events, the 800m middle distance runners' performance is better than the 1500m and 3000m runners. The following points are some of recommendations given by the researcher:
Anaerobic training is given at in different phases of the training year. Therefore, the intensity of this training must consider the training capacity and experience of athletes.

Either increment or decrement of volume and intensity is the baseline when delivering the training load for middle distance runners so that the increase of the volume and intensity must be

followed by the scientific training principles. Moreover, the load of the training has to be selected properly to minimize the occurrence of injury.

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