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SPEED ENDURANCE (MIDDLE DISTANCE)

Jasur Akhmatov
3rd year student of UZSUPES
Dilyara Kabilova
2nd year student of UZSUPES

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Abstract. *This articles show the individual anaerobic threshold (IAT) for middle distance runners develops during the basic training periods in autumn (TP-1; 12 weeks) and spring (TP-2; 8 weeks), and during the competition periods in winter (CP-1; 8 weeks) and summer (CP-2; 16 weeks), depending on subjects' training intensity and volume. Compared to the initial value the running speed was significantly higher for T at IAT for all further measurements. IAT values changed significantly in the trained group only. TP-1 and TP-2 showed the highest increases for IAT is shown to show growth.*

Keywords: *Aerobic capacity, individual anaerobic threshold, exercise testing, treadmill ergometry, training, speed endurance, maximum speed.*

СКОРОСТНАЯ ВЫНОСЛИВОСТЬ (СРЕДНЯЯ ДИСТАНЦИЯ)

Аннотация. *В статье рассмотрено развитие индивидуального анаэробного порога (ИАТ) у бегунов на средние дистанции в периоды базовой подготовки осенью (ТР-1; 12 недель) и весной (ТР-2; 8 недель), а также в периоды соревнований зимой. (КП-1; 8 недель) и летних (КП-2; 16 недель) в зависимости от интенсивности и объема тренировок испытуемых. По сравнению с исходным значением скорость бега была достоверно выше для Т при ИАТ при всех дальнейших измерениях. Показатели ИАТ достоверно изменились только в тренированной группе. ТР-1 и ТР-2 показали самый высокий рост IAT*

Ключевые слова: *аэробная работоспособность, индивидуальный анаэробный порог, нагрузочное тестирование, тредмил-эргометрия, тренировка, скоростная выносливость, максимальная скорость.*

INTRODUCTION

The success of athletes in competitions with a duration between 3 and 10 minutes is strongly influenced by the aerobic metabolism [1, 2]. Several methods have been developed to get reliable information about the aerobic capacity of middle and long distance runners [3-5]. In addition to respiratory parameters, methods based on determining blood lactate concentration during continuously increasing exertion are favored for this [6-11]. The determination of the individual anaerobic threshold (IAT) serves as an objective measure for aerobic endurance [12-15]. Two procedures based on lactate measurements have become standard in the practice of performance diagnostics. First, there is the process of determining IAT according to Stegmann et al. [14], and second, there is the process as described by Dickhuth et al. [16]. In the latter case, IAT is defined as the lactate concentration 1.5mmol l -1 above the lactate threshold. A high reliability has been proven for both procedures [7, 8]. The essential importance in determining IAT lies in the control and classification of training in the desired metabolic range [4, 5]. Therefore, performance prognoses are made based on IAT [4, 5]. Thus, it could be shown that endurance runners could improve their aerobic capacity as measured by the IAT by increasing their aerobic training [17]. If one observed middle distance runners throughout the course of a year, then an increase in aerobic training in the 12-week basic training phase in fall/winter should be reflected in an increase in the IAT. To date, there are no studies which examine whether increases in training volume during the basic training phases for middle distance runners lead to an increase in IAT

before the competition phase. It has also not been examined whether a reduction of the extensive speed training during the competition periods leads to a reduction in IAT, so that the full aerobic endurance is possibly not available to the athletes for the entire competition period. Accordingly, the aim of this study was to elucidate whether a typical training periodisation of middle distance runners leads to expected changes in IAT-levels and how IAT-levels are affected during periods with increased high intensive training and competitions.

METHODOLOGY

The middle distance events in track and field have a sizeable anaerobic energy system contribution when the distance is done to exhaustion. The percentage of anaerobic contribution varies from 50% in the 800 meters to 80% in the 1600 meters. Because the energy contribution is so extensive, many training sessions need to be implemented during the track and field macrocycle to properly train and develop the mechanics and pathways of the system.

In sprinting terminology, maximum effort is tied to maximum speed. Many studies have shown that maximum speed in an athlete can only be maintained for 60-80 meters before fatigue deteriorates performance. There is considerable benefit in year-round, balanced, multi-lateral training where all runners, including middle-distance athletes, never get far from continued development of the primary training component of maximum speed. As maximum speed gets faster in an athlete, so do the anaerobic components which facilitate that energy delivery process.

Since maximum speed can only be maintained for 60-80 meters, it is realistic to conclude that all standard track races, including middle distance races, are run at sub-maximum speed if done to exhaustion. While it has been shown that frequent training stimuli of maximum speed work makes all runners “faster”, it has also been shown that frequent training at a fractionalization of maximum speed values improves sub-maximum performance. Training theory states that he faster the race, the greater the need for sub-maximum training stimuli closer to the maximum speed ability of the runner.

Middle distance racing is done at a sub-maximum speed. Logically, middle distance racing pace is just a bit slower then the pace sprinters use to complete a 400 meter effort. Because of the pace demands of a middle distance race, training theory calls for frequent work sessions that are at a high fractionalization of maximum speed (Table 1). Work done at the listed efforts provides the stimulus for development of the metabolic and muscular pathways needed to maintain a fast middle distance race pace. It is suggested that each of the three fractionalized modalities be part of a twelve day training microcyle during the specific preparation and pre-competition periods of the track macrocycle.

Special Endurance 1 and Special Endurance 2 training sessions are commonly done by middle distance runners during the track microcycle. The most often done work being interval-style repeats of 200 meters and 400 meters. Frequently, coaches wait too long to implement them into the training scheme. The time-frame for complete development of the anaerobic energy system is 10-12 weeks, so a coach cannot wait too long to bring this type of work to the runners.

The anaerobic training modality not often seen in middle distance training programs is called Speed Endurance. These are training sessions that are just a bit slower than maximum speed efforts. Training sessions that target Speed Endurance stimulate the body’s energy and muscular systems to carry a very fast velocity to near exhaustion. This type of work is among the most technical efforts that a middle distance runner can do, so it is the role of the coach to mark the track (or grass course) so that elapsed time can be aligned with the exact distance in setting up and evaluating the work. As in all anaerobic work, the coach plays the key role of regulating intensity

of effort. This is done by regulating the level of recovery between bouts of work. Speed Endurance work requires relatively long recovery intervals.

Training Modality	Extent/Intensity	Volume/Rest
Speed Endurance	60 meters to 150 meters 97% max effort	[Example] 2 sets of 4 reps of 120 meters. 6 minutes rest between.
Special Endurance 1	150 meters to 300 meters 95% max effort	[Example] 2 sets of 3 reps of 200 meters. 4 minutes rest between
Special Endurance 2	300 meters to 600 meters 92% max effort	[Example] 1 set of 4 reps of 500 meters. 3 ½ minutes rest between.

Table 1. Work sessions that target the anaerobic energy system.

The correct implementation of a Speed Endurance training session is as follows.

- Target: Anaerobic Capacity
- Intensity: 97% of max speed m/s value or about 103% of 400 pace
- Total Session Volume: 300-1000 meters
- Rest: 6 minutes between each rep
- Work Duration: 60-150 meters

A Speed Endurance workout session is as follows:

With a measuring wheel and can of spray paint, mark a dot on the track exactly 150 meters from the finish line.

- 2 mile very active warm-up. Strides. Basically, race day preparation.
- Extent of work is 4 * 150 meters on the track at max effort. Use a starting device.
- Rest is 6 minutes between.
- Time goal is their *date pace* 400 meter time multiplied by .35.
- 3 mile easy run @AT.

Another example of a Speed Endurance session:

Be very careful with this workout. It is more than just strides because it is done as the first unit in the session.

- Very light static stretch followed by 2 mile active warm-up. Then 1 mile of additional mixed intensive striding and jogging.
- 7 x 140 meters fast on grass. Use a starting device for an exact start and good acceleration from a crouch. 6 min rest between.
- 2 mile gentle cool down

CONCLUSION

Increased EST volumes seem to be an appropriate training strategy prior to competition periods, because the most substantial increase in IAT could be shown subsequently to the training periods in which the highest volumes of EST were carried out - particularly since the only change in training consisted of a significant increase in EST volume. There fore, the results of this study agree with established exercise theories, which suggest increasing EST volumes mainly in TP 1 and TP 2. The aerobic capacity acquired during TP 1 and TP 2 seems to be available and unlikely

to change over a period of at least 8 weeks during a competition period. It is interesting to note, that this is also true when EST are reduced due to competitions, as illustrated by the participants of this study. However, intervention studies must prove whether the slight decrease in IAT at the end of CP 2, which typically lasts for four months, can be prevented by an increase in EST. Particularly athletes with a relatively late season climax could profit from such an intervention.

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