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European Journal of Experimental Biology, 2012, 2 (4):1106-1108

ISSN: 2248 –9215
CODEN (USA): EJEBAU

Effect of time of day on anaerobic responses with high intensity exercise

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ABSTRACT

The purpose of this study was to survey the Effect of time of day on anaerobic responses with high intensity exercise. 12 athletes (22.53 ± 3.18 year, 174.32 ± 2.65 cm, 7 0.12 ± 2.18 kg) with background 3 years experience in physical activity suddenly selected. From Wingate test used for evaluation of participation's maximal anaerobic power. Vo_{2max} was recorded during the test (30 sec) in morning (8 o'clock) and after 3 days in evening (6 o'clock). The effect of time of day was tested using independent t tests for comparisons data. Statistical significance was set at $p<0.05$. Results of present study were shown that During the Wingate test increased anaerobic power. VO_{2max} increased significantly from morning to evening during the Wingate Test. And that was significant statistically. Time of day effects on anaerobic performances during the Wingate test is mainly due to better aerobic participation in energy production during the test in the evening than in the morning.

Key words: maximal anaerobic power, Wingate test, intensity exercise, athletes

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INTRODUCTION

To date, although the effect of time-of-day on aerobic performances appears to be equivocal, during anaerobic exercises, the effect of time-of-day has been well established with early morning nadirs and peak performances in the late afternoon. These diurnal rhythms can be influenced by several factors such as the regular training at a specific time-of-day. Indeed, regular training in the morning hours may increase the lower morning performances to the same or even higher level as their normal diurnal peak typically observed in the late afternoon by a greater increase of performance in the evening. However, regular training in the evening hours may increase the morning-evening (i.e., amplitude of the rhythm) difference by a greater increase of performance in the late afternoon. Therefore, adaptations to training are greater at the time-of-day at which training is regularly performed than at other times [1]. The training program increase muscle strength and power especially after training in the morning hours and the magnitude of gains was greater at the time-of-day-specific training than at other times. In conclusion, these results suggest that time-of-day-specific training increases the child's anaerobic performances

specifically at this time-of-day. Moreover, the improvement of these performances was greater after morning than evening training [2]. The circadian cycle in all-out competitive performance may be due to changes in motivational drive to tolerate strenuous exercise rather than to rhythms in maximal physiological functions. As shown in our paper on swimming all-out exercise performance tends to exhibit a circadian rhythm closely in phase with that of body temperature. The fluctuations in performance do not seem to be accompanied by changes in aerobic power or muscular efficiency [3]. The net efficiency increased from the morning to evening (17.3±4 vs. 20.5±2%; $p<0.05$), and the variability of cycling cadence was greater during the morning than evening (+34%; $p<0.05$). These findings suggest that VO_2 responses are affected by the time of day and could be related to variability in muscle activity pattern [4]. Hill DW provides evidence of a circadian rhythm in aerobic and anaerobic responses to high-intensity short-duration exercise, in women as well as in men [5]. Diurnal variation of sports performance usually peaks in the late afternoon, coinciding with increased body temperature. This circadian pattern of performance may be explained by the effect of increased core temperature on peripheral mechanisms, as neural drive does not appear to exhibit nycthemeral variation. This typical diurnal regularity has been reported in a variety of physical activities spanning the energy systems, from Adenosine triphosphate-phosphocreatine (ATP-PC) to anaerobic and aerobic metabolism, and is evident across all muscle contractions (eccentric, isometric, concentric) in a large number of muscle groups. Increased nerve conduction velocity, joint suppleness, increased muscular blood flow, improvements of glycogenolysis and glycolysis, increased environmental temperature, and preferential meteorological conditions may all contribute to diurnal variation in physical performance. However, the diurnal variation in strength performance can be blunted by a repeated-morning resistance training protocol [6]. Kin-Isler (2006) also believed that the time of day had an effect on the test results. Circadian rhythms refer to physiological changes over a 24-hour time period. Body temperature has been stated to be the "fundamental variable" because it shows a distinct rhythm with a peak around 18:00 and a trough around 06:00h [7]. A time-of- day effect should be considered when testing subjects because a larger power decrease occurred during the early morning rather than the afternoon [8]. Biologic rhythms are defined as cyclic changes that recur regularly over a given time and circadian rhythms refer to variations recurring periodicity of 24 hours (Reilly,2000 and Atkinson, 1996) Time of day has been shown to influence both aerobic performance (Atkinson, 1996, Atkinson, 2005), and anaerobic power and capacity (Melhim, 1993 and Souissi, 2002). Moreover,both concentric and eccentric strength parameters were measured at different Time of day peak at early evening (Souissi, 2002, Wyse, 1994) [9]. These results suggest that Ramadan might modify the circadian rhythm of muscle power and fatigue during the Wingate test by decreasing power output and increasing muscle fatigue at the time of the acrophase [10]. The purpose of this study was to survey the Effect of time of day on anaerobic responses with high intensity exercise.

MATERIALS AND METHODS

12 athletes (22.53 ± 3.18 year, 174.32 ± 2.65 cm, 70.12 ± 2.18 kg)) with background 3 years experience in physical activity suddenly selected.. From Wingate test used for evaluation of participation's maximal anaerobic power. Vo_{2max} was recorded during the test (30 sec) in morning (6 o'clock) and after 3 days in evening (6 o'clock). The effect of time of day was tested using independent t tests for comparisons data. Statistical significance was set at $p<0.05$.

RESULTS AND DISCUSSION

During the Wingate test increased maximal anaerobic power. VO_{2max} increased significantly from morning (41.22 ± 2.45) to evening (46.54 ± 3.16) during the Wingate Test. maximal anaerobic power was significant statistically. Time of day effects on performances during the Wingate test is mainly due to better anaerobic participation in energy production during the test in the evening than in the morning.

Table 1. The comparison of maximal anaerobic power in morning and evening

Index / Variable	morning (Mean ± SD)	evening (Mean ± SD)	P Value
anaerobic power (ml/kg/min)	41.22 ± 2.45	46.54 ± 3.16	0.03*

*=*Significant*

CONCLUSION

The purpose of this study was to survey the Effect of time of day on anaerobic responses with high intensity exercise. In conformation of the result of research, Hill DW, 1992, provided evidence of a circadian rhythm in aerobic and anaerobic responses to high-intensity short-duration exercise, in women as well as in men, Also, many researcher, indicated that Time of day to influence both aerobic performance and anaerobic power and capacity [1, 2 4, 9]. Earlier studies often have reported that the effect of time-of-day has been well established with early morning nadirs and peak performances in the late afternoon (1). It can be concluded that aerobic capacity can be influenced by duration of daily. It was concluded that superior exercise performance in the evening may be attributed to a greater tolerance for high intensity exercise which is closely associated with the acrophase in body temperature [3]. This study suggests that anaerobic performance more than better will done in evening, although we need more research about this matter, because this study is done in laboratory situation.

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