

Effect of time of day on aerobic responses with high intensity exercise in volleyball players

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ABSTRACT

The purpose of this study was to survey the effect of time of day on aerobic responses with high intensity exercise in volleyball players. 8 volleyball players (23.42 ± 2.15 year, 193.45 ± 3.14 cm, 84.13 ± 4.12 kg) suddenly selected. From Wingate test used for evaluation of participation's maximal aerobic power. VO_{2max} was recorded during the test (30 sec) in morning (8 o'clock) and after 3 days in evening (6 o'clock). During the Wingate test increased maximal aerobic power. VO_{2max} increased significantly from morning to evening during the Wingate Test. And that was significant statistically. Time of day effects on aerobic 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 aerobic power, Wingate test, intensity exercise, volleyball players

INTRODUCTION

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 [1]. The net efficiency increased from the morning to evening (17.3 ± 4 vs. $20.5 \pm 2\%$; $p < 0.05$), 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 [2]. The results indicated that oral temperature, P_{peak} , P_{mean} and P_{max} varied concomitantly during the day. These results suggest that there was a circadian rhythm in anaerobic performance during cycle tests. The recording of oral temperature allows one to estimate the time of occurrence of maximal and minimal values in the circadian rhythm of anaerobic performance [3]. 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 [4]. 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 [5]. 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 [6]. 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) [7]. The purpose of this study was to survey the effect of time of day on aerobic responses with high intensity exercise in volleyball players.

MATERIALS AND METHODS

8 volleyball players (23.42 ± 2.15 year, 193.45 ± 3.14 cm, 84.13 ± 4.12 kg) suddenly selected. From Wingate test used for evaluation of participation’s maximal aerobic power. VO_{2max} was recorded during the test (30 sec) in morning (6 o’clock) and after 3 days in evening (6 o’clock). During the Wingate test increased maximal aerobic power. VO_{2max} increased significantly from morning to evening during the Wingate Test. And that was significant statistically. Statistical analyses were done using SPSS/19. The effect of exercise protocol was tested using dependent t test for comparisons data. Statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

During the Wingate test increased maximal aerobic power. VO_{2max} increased significantly from morning (49.34 ± 3.23) to evening (51.12 ± 2.65) during the Wingate Test. maximal aerobic power was significant statistically. Time of day effects on 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.

Table1. The comparison of maximal aerobic power in morning and evening ($P \leq 0.04$)

Index Variable	morning (Mean \pm SD)	evening (Mean \pm SD)	P Value
maximal aerobic power (ml/kg/min)	49.34 ± 3.23	51.12 ± 2.65	0.04*

*=Significant

CONCLUSION

The purpose of this study was to survey the effect of time of day on aerobic responses with high intensity exercise in volleyball players. In conformation of the result of research, Jeanick, 2007, suggested that VO_2 responses are affected by the time of day and could be related to variability in muscle activity pattern, Also, Atkinson, 1996, Atkinson, 2005, indicated that Time of day to influence both aerobic performance and anaerobic power and capacity [2, 7]. Earlier studies often have reported that maximal aerobic power of the morning is higher in the evening (1, 4 and 5). 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 [1]. This study suggests that aerobic 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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