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PHYSIOLOGICAL PROFILE EVALUATION THROUGH LACTATE AND HEART RATE IN NATIONAL LEVEL GRECO-ROMAN WRESTLERS

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ABSTRACT

The purpose of this study was to evaluate the physiological profile of top-level wrestlers in a simulated competition. 12 male athletes, aged 23.2±4.5yrs who were participants in the 74kg division at the Greece National Greco-Roman Championship were the evaluated subjects. During all competitions the heart rates were measured and stored with a transmitter with a digital display while the capillary blood samples were collected 3 minutes after each round was completed in order to evaluate the lactate concentrations. The statistical design was based on the One-Sample T-Test analysis. The statistics showed that the mean-max heart rate values ($\text{b}\cdot\text{min}^{-1}$) and mean-max lactate concentrations ($\text{mmol}\cdot\text{l}^{-1}$) in 2nd and 3rd round were significantly higher than in the 1st round. Specifically, the values were as follows: 1st round $\text{HR}_{\text{mean}} 138\pm 4$ - $\text{HR}_{\text{max}} 143$; $\text{La}_{\text{mean}} 12.43\pm 2.8$ - $\text{La}_{\text{max}} 15.80$, 2nd round $\text{HR}_{\text{mean}} 172.2\pm 5.6$ - $\text{HR}_{\text{max}} 178$; $\text{La}_{\text{mean}} 13.67\pm 2.7$ - $\text{La}_{\text{max}} 19.3$, 3rd round $\text{HR}_{\text{mean}} 183\pm 6.3$ - $\text{HR}_{\text{max}} 193$; $\text{La}_{\text{mean}} 14.6\pm 2.7$ - $\text{La}_{\text{max}} 20.26$. The results indicate that the physiological profile of these wrestlers was both aerobic and anaerobic. Conclusively, the wrestling aerobic training with a simultaneously increase in anaerobic threshold could contribute to a benefit in tactical especially in the last round of a Greco-Roman wrestling competition.

KEY WORDS: wrestling, aerobic component, anaerobic threshold

INTRODUCTION

Wrestling was one of the most favored events in the Olympic Games in Ancient Greece. From the Athens Games in 1896, until today, the wrestling events are also an also an important part of the modern Olympic Games. The superior performance of today's wrestlers is the result of a complex blend of many factors such as the genetic endowment, as well as the coaches' knowledge in new training techniques. The pure coach knowledge of any one of their athlete physical condition is important in order to plan the optimal training strategies for winning. The ideal physical and physiological profile of top-level Greco-Roman wrestlers must be based on a high aerobic training accompanied with good flexibility and low percentage of body fat (Utter et al. 2002). Similarly, present study reported that aerobic capacity is one of the most important factors for success in wrestling with the athlete's ability to maintain the maximal aerobic power in a period of time gives an advantage in top-level wrestlers, (Yoon, 2002).

In addition, research has revealed that the well aerobically trained wrestlers compete before the initiation of the feeling of muscular fatigue in the intensity of 85% of their $\text{VO}_{2\text{max}}$ (Pulkkinen, 2002). According to the wrestlers level, the National level athletes' have $\text{VO}_{2\text{max}}$ from 53 to 56 $\text{ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ while the participants in Seoul 1988 Olympic Games reported to have mean $\text{VO}_{2\text{max}}$ values of 60 $\text{ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$, (Kelly, et al. 1998). However, in other studies World-class wrestlers recorded a mean $\text{VO}_{2\text{max}}$ of 54.3 $\text{ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ while the young and elite free-style wrestlers reported to have $\text{VO}_{2\text{max}}$ 52.6±2 $\text{ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ and 54.6±2 $\text{ml}\cdot\text{kg}^{-1}\cdot\text{min}^{-1}$ respectively, (Callan, et al. 2000; Zen-Pin, & Ryder, 2004). In the point of view of the anaerobic performance, which usually used to describe an athletes' capacity for high intensity short-term exhaustive exercise where the force generated by repeated muscular contractions, is primarily dependent upon anaerobic processes for energy release.

The top-level wrestlers' anaerobic profile is characterized by an increase in production of lactic acid, creatine phosphate and the buffer capacity of muscles and blood. The mean power output of an expert wrestler ranged from 6.1 to 7.5 $\text{W}\cdot\text{kg}^{-1}$ for the upper body (arm cranking) while the average mechanical power that is elicited from the wrestler for the lower body (30s max cycling) counted from 11.5 to 19.5 $\text{W}\cdot\text{kg}^{-1}$, (Horswill, 1992). In addition, the lactic acid accumulations in top-level wrestlers after the 30s Wingate Anaerobic Test (WAnT) was 11.9 $\text{mmol}\cdot\text{l}^{-1}$ for max cycling and 11.8 $\text{mmol}\cdot\text{l}^{-1}$ for arm cranking, (Hubner-Wosniak, et al. 2004). The recent rule changes

related with the competition duration (2-3 rounds of 2min with rest-time of 30s) has changed the metabolic and training profile in today's wrestlers. Despite of the fact that wrestling in Greece gives a large number of champions in International Championships, limited research has been applied in the evaluation of lactic acid concentration and heart rate variation in top-level wrestlers. The purpose of this study was to estimate the physiological profile of top-level wrestlers during the a simulated competition.

METHODOLOGY

12 male specialists in Greco Roman wrestlers aged 23.2 ± 4.5 yrs who were participated in the 74kg division at the National Championship was this study subjects. During all the competitions (3 periods of 2min) the heart rate data were measured and stored with a transmitter with digital display (Polar RS100™, Polar Electro Oy, Kempete, Finland). The capillary blood samples collected from the earlobe 3min after each round of completion. The tubes with capillary blood from each sampling were analyzed with the use of a calibrated portable mini Photometer Accusport (Boehringer Mannheim) in order to evaluate the subject's blood lactate concentration. The statistical design for the measured variables of this study was based on the One-Sample T-Test for repeated measures. The acceptable level of significance was set at 0.05 and all results were reported as mean \pm standard deviation. SPSS statistical software version 16.0 for Windows (SPSS Inc., Chicago, IL, USA) was used for data management and statistical calculations.

RESULTS

The exploration analysis showed that in the 1st round in wrestlers with high heart rate the lactate concentration linearly increased with the energy contribution in this competition round to be primarily aerobically, (Figure 1.)

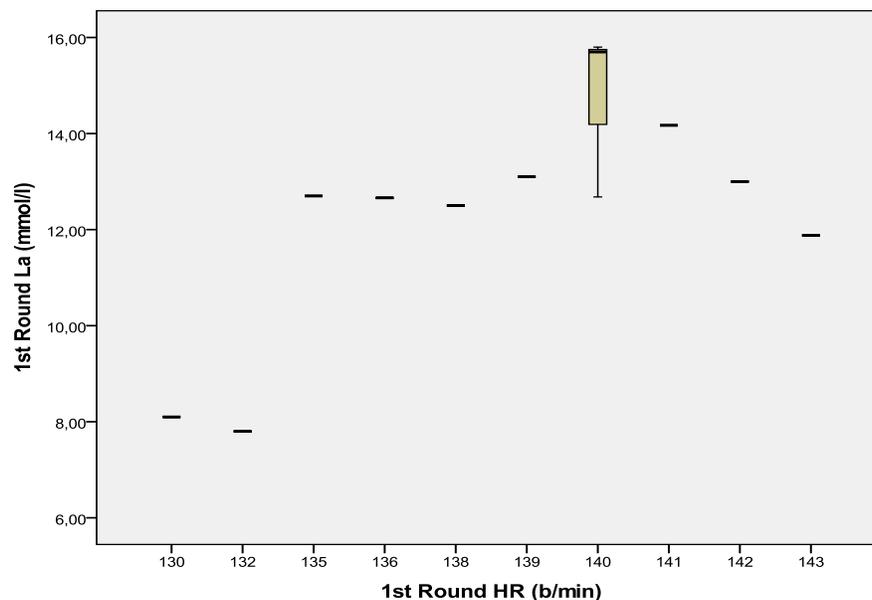


Figure 1. Graphical displays (mean) of heart rate and lactate concentration during the wrestlers 1st round in Greco-Roman competition.

However, the descriptive statistics showed that in the 2nd round in wrestlers with high heart rate, the lactate concentration linearly increased above the anaerobic threshold with the metabolic energy supplies to be both aerobic and anaerobic, (Figure 2.).

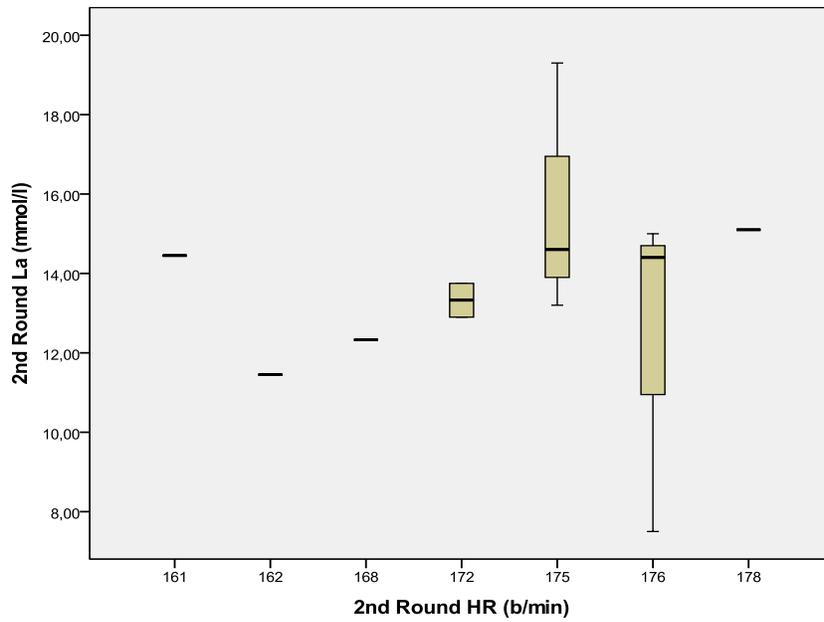


Figure 2. Graphical displays (mean) of heart rate and lactate concentration during the wrestlers 2nd round in Greco-Roman competition.

Similarly in the 2nd round the summary procedure showed that in 3rd round the wrestlers observed to work above the heart rate the lactate anaerobic threshold primarily anaerobically, (Figure 3.).

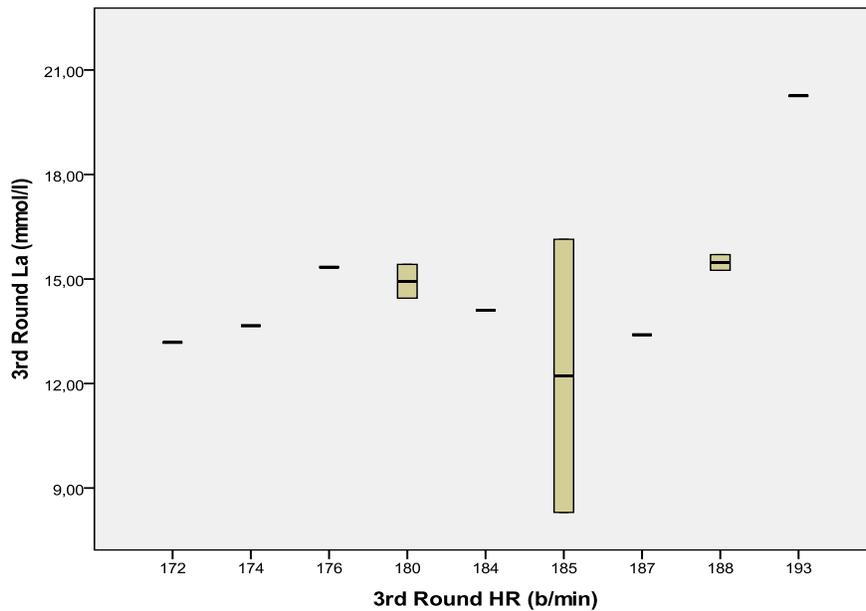


Figure 3. Graphical displays (mean) of heart rate and lactate concentration during the wrestlers 3rd round in Greco-Roman competition.

The T-test statistical procedures showed that both the mean heart rate values and lactate concentrations, in the 2nd and 3rd round were significantly higher than in the 1st round, (Table 1).

Table1. Athletes' Heart Rate values (mean-max) and Lactate accumulation (mean-max) after each of the 3 rounds of Greco-Roman wrestling competition.

	HR	HR max	La	La max
	b.min ⁻¹	b.min ⁻¹	mmol.l ⁻¹	mmol.l ⁻¹
1 st Round	138±4	143	2.43±2.8	15.8
2 nd Round	172±5 *	178	13.67±2.7 *	19.3
3 rd Round	183±6 †	193	14.6±2.7 †	20.26

* significantly higher than in 1st Round, (p<0.001-2-tailed),

† significantly higher than in 1st Round, (p<0.001-2-tailed)

DISCUSSION

This study results confirmed that the Greco-Roman wrestling according to the new rules for competition duration begins aerobically while it finishes anaerobically. For this reason the coaches must determine the importance of the aerobic training in the annual planning especially in top-level wrestlers. The benefit of the highly aerobically trained athletes' is the fatigue resistance, especially at the 3rd round of the wrestling competition. The lactate values of the wrestlers who participated in this study increased gradually from the first to the last round. In the present study, wrestlers' recorded lactate concentrations were similar with other studies which evaluated with a competitive research design top-level wrestlers lactate accumulation, (Horswill, et al. 1989; Schmidt, et al. 2005).

While a number of studies proposed that important factors for outstanding performance in top-level Greco-Roman wrestlers is to focus in maximal power and strength endurance training, (Sharratt, et al. 1986; Nilsson, et al. 2002; Yoon, 2002) this study findings reported that improvements in both the aerobic and anaerobic profiles could give a boost to muscular fatigue resistance, mainly in the 3rd round. This advantage could be an important training tool, which can diversify the coach's tactical actions focusing on the wrestler win in the competition. In conclusion the role of aerobic-anaerobic training is still crucial in today's Greco-Roman wrestlers. In very well aerobically prepared athletes the muscular resistance can give an advantage to the coach for the tactical manipulation for winning the competition.

REFERENCES

- CALLAN, S.,D., BRUNNER D.,M., DEVOLVE, K.,L, MULLIGAN, S.,E., HESSON J, WILBER R.,L, and J.,T. KERNEY. (2000). Physiological profile of elite freestyle wrestlers. *Journal of Strength and Conditioning Research*, 14: 162-169.
- HORSWILL, C.,A., MILLER, J.,E., SCOTT, J.,R. SMIDTH, C.,M., WELK, G, and P. VAN HANDEL. (1989). Anaerobic and aerobic power in arms and leg of elite senior wrestlers. *International Journal of Sports Medicine*, 13 (8): 558-561.
- HORSWILL, C.,A. (1992). Applied physiology of amateur wrestling. *Sports Medicine*, 14(2): 114-143.
- HUBNER-WOZNIAK E., KOSMOL, A., LUTOSLAWSKA, G., and E.,Z. BEM. (2004). Anaerobic performance of arms and leg in male and female freestyle wrestlers. *Journal of Science and Medicine in Sport*, 7 (4): 473-480.
- KELLY, J.,M., GORNEY, B.,A, and K.,K. KALM. (1998). The effect of collegiate wrestling season on body composition, cardiovascular fitness and muscular strength and endurance. *Medicine and Science in Sports and Exercise*, 10: 119-124.
- NILSSON, J., CSERGO, S., GULLSTRAND, L., TVEIT, P., and P.,E. REFSNES. (2002). Work-time profile, blood lactate concentration and rating of perceived exertion in the 1998 Greco-Roman wrestling World Championship. *Journal of Sport Science*, 20 (11): 939-945.
- PULKKINEN, W. (2002). The physiological composition of elite judo players. *Sport science of Elite Judo Athletes*, February. Available from: <http://www.JudoInfo.com>.
- SCHMIDT, W.,D., PIENCIKOWSKI, C.,L, and R.,E. VAN DERVEST. (2005). Effects of competitive wrestling season on body composition, strength, and power in national collegiate athletic association division III college wrestlers. *Journal of Strength and Conditioning Research*, 19: 505-508.
- SHARRATT, M.,T, TAYLOR, A.,W, and M.,K. THOMAS. (1986). Physiological Profile of elite Canadian freestyle wrestlers. *Canadian Journal in Applied Sport Science*, 11 (2): 100-105.
- UTTER, A.,C, O' BRYANT, H.,S, HAFF, G.,G, and G.,A. TRONE. (2002). Physiological profile of an elite free style wrestler preparing for competition: a case study. *Journal of Strength and Conditioning Research*, 308-315.

11. YOON, J. (2002). Physiological profile of elite senior wrestlers. *Journal of Sport Medicine and Physical Fitness*, 32: 225-233.
12. ZEN-PIN, L., and C.,E. RYDER. (2004). The study of physiological factors and performance in welter weight taekwondo athletes. *Sport Journal*, 7(2): 34-40.