LOOK ACADEMIC PUBLISHERS

International Journal of Environmental & Science Education, 2016, **11**(5), 973-977

Effects of Short Term Camp Periods on Aerobic and Anaerobic Performance Parameters in Ice Hockey National Team Athletes

Serdar Eler
Gazi University Sport Science Faculty, TURKEY

•*Received 24 June 2015* •*Revised 10 December 2015* •*Accepted 17 March 2016*

This study was conducted for determining the effects of trainings, applied to athletes during short term camp period, on their aerobic and anaerobic performance. Measurements were made by the participation of 28 volunteer male ice hockey national team players. During the 15-day camp period, 10-minute running and stretching for warming and then 40-minute jogging practice was performed in the mornings, and at evenings, following warming and stretching for the same lengths, general strength practices were applied. On the first and last day of the camp period, after making body weight and height measurements, respectively, the Running-Based Anaerobic Sprint Test (RAST) and 20m shuttle running tests were performed. The obtained data were evaluated by the paired-t test. As a result of the study, when the two measurements were compared, there was no significant difference found between speed, maximal oxygen consumption (VO2max) and fatigue index (FI) ($p>0,05$); significant differences were found between the two measurements in heart rate (HR) during maximal loading ($p<0,05$). Based on these results; it was concluded that although trainings performed during short term camp period lowered number of heart beats at maximal running speed, this time was not sufficient for developing performance.

Keywords: RAST, 20m shuttle run, performance, ice hockey.

INTRODUCTION

Performance tests, developed as parallel to scientific developments in sports sciences, are used in the measurement and evaluation of physiologic parameters. Based on the results received from these tests, practice programs are arranged based on the results obtained from these tests and thus performance development is managed (Astrand 1986). Specifically, it is extremely significant that, in especially endurance sports, certain physiological parameters (HR), maximal oxygen consumption (VO2max), running speed (km/h), lactic acid level (La), and anaerobic threshold (AnT), etc. are determined for practice follow up and evaluation.

Correspondence: Serdar Eler
Gazi University, Sport Science Faculty, Turkey
E mail: serdareler@hotmail.com
doi: 10.12973/ijese.2016.507a

Originally published by Look Academic Publishers in IJESE (ISSN: 1306-3065)

Endurance is defined as resistance capacitance of athletes against fatigue (Hare 1982) and at the same time it determines limits of time to be manifested by a performance in certain intensity (Bompa 2003).

Ice hockey is a sports branch with intense anaerobic stress metabolically yet aerobic capacity being very important as well due to its extensive length. Moreover, an aerobic system is required for rapid recovery following anaerobic stress within game (Montgomery 1988, Cox 1995). Performance characteristics and information on Turkish ice hockey players is rather limited. Thus, this study was conducted for determining the effects of practices applied on athletes who are in camp period on aerobic and anaerobic performance

METHOD

Research Group: This study was carried out by the participation of 28 male ice hockey national team players during the camp period in October 2010 (Table 1).

Camp Period Practice Program: During the 15-day camp period, following 10-minute warm up running and stretching, 40-minute jogging practice was applied and at evenings following warm up and stretching for the same lengths, general strength practices were applied.

Survey instrument

Height and Body Weight Measurement: Body weights of subjects were measured in kilogram by Tanita HD 358 brand mark body composition analyzer, and their heights were measured in 0.01cm sensitivity by a stadiometer.

Table 1. Physical characteristics of athletes

Parameters	Age (Year)	Height (cm)	Body weight (kg)	BMI (kg/m^2)	Age of experience (Year)
n=28	21,33 ± 2,24	1,78 ± 0,06	76,92 ± 3,26	43,06 ± 6,41	7,60 ± 3,60

20m Shuttle Run Test: A 20-m race tract was prepared in the gymnasium for tests. 1 m signs were placed at both ends of the running area towards inside. Speed signals were given by Tümer Prosport Esc 1000 Test Timer. The athletes were asked to adjust their pace according to the arriving sound signals. They started to run at 8 km/h speed by a protocol that increases 0.5 km/h every minute, and were asked to continue the test until exhaustion (Ergen 2007). The scores obtained were estimated by means of the rating scale, approximate maximum oxygen consumption (VO2max) values were calculated in ml/kilogram/minute (Zahner 2006). Moreover, the speed at the moment of leaving the running and heart rate at the same speed was determined by polar telemetry.

RAST (The Running-based Anaerobic Sprint Test)

The athletes were asked to run the 35-meter distance 6 times at maximum speed and to become ready within 10 seconds to run each 35-meter distance over again. Each 35 meters run by the athletes was recorded as seconds (0.01).

Fatigue index (FI) was estimated according to the following formula in the evaluation.

Evaluation:

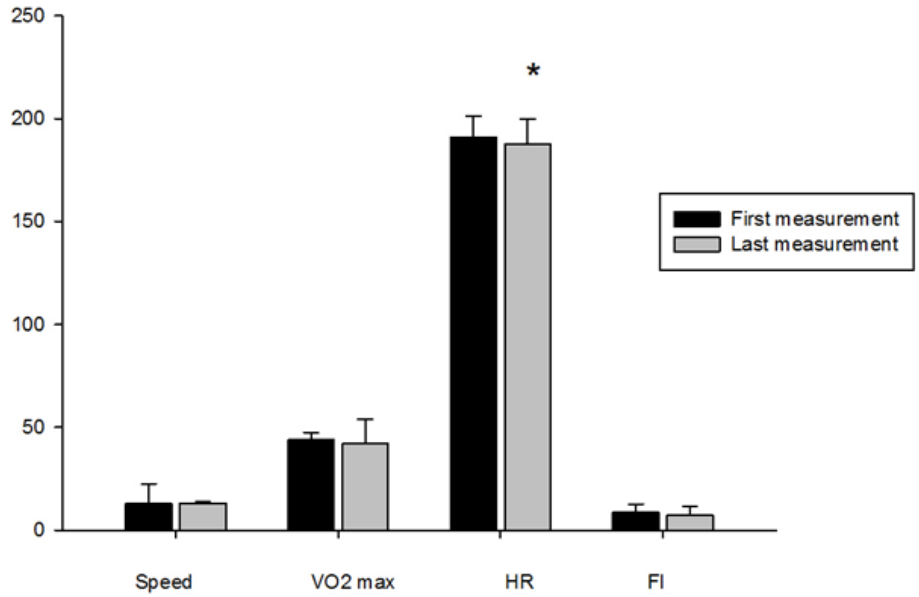
1. Speed: distance/time
2. Acceleration: distance/time
3. Power: Weight x Acceleration
4. Power: weight (kg) x distance 2 (m)/ time 3 (sec);

5. Fatigue Index: (Maximum Power – Minimum Power) / total time for 6 running
6. Maximal Power – The highest value
7. Minimal Power – The lowest value
8. Average Power – average of 6 values

Power (Watt) = Weight (kg) x Distance ^{2} ÷ Time ^{3} (sec)

Data analysis

Statistical analyses of the data were made in SPSS 15,0 (144.122.202.4 ODTÜ-demo) package program and the values were expressed as an average and standard deviation (X±SD). Paired-t test was used in data analysis and the significance level was accepted as $p<0.05$.



Graph 1. Performance profiles of athletes.

RESULTS

Trainers and sports experts determine strength and capacity of athletes that they train, and prepare practice programs accordingly and try to improve their performances. In this study, which was conducted to determine the effects of practices on aerobic and anaerobic performance applied during the camp period in ice hockey athletes, it was determined that short-term camp period was not sufficient for the improvement of the performance parameters.

Table 2. Performance parameters of the athletes

Parameters (n=28)	**X±SD**	**P**
Speed (km/h)	12,94±,95	0,19
Speed-2 (km/h)	13,15 ± ,93	
VO_2 max (ml/kg/min)	43,99 ± 3,48	0,31
VO_2 max -2 (ml/kg/min)	41,96 ± 11,89	
HR (beat/min)	190,88 ± 10,23	**0,01***
HR-2 (beat/min)	187,76 ± 12,05	
FI (Watt)	8,69 ± 3,93	0,25
FI-2 (Watt)	7,32 ± 4,19	

Koz and Taşdemir showed in their study carried out in 2009 for determining performance characteristics of Turkish Ice Hockey National Team players that on-ice performance values of our athletes were significantly behind those of the national team athletes of other countries.

There are not many investigations in literature on fatigue index values. In this study, there were no significant differences determined between fatigue index values either in measurements taken in 15-day interval (p>0,05). In the norm investigation conducted by Maud et.al, Wingate FI values were found to be 37,67%±9,89 in men, and they were 35,05%±8,32 in women (Maud et al. 1989). In another study conducted on sports department male students (Koşar 1996), FI was determined to be 42% and 39% in two different measurements taken in one week interval. In another investigation conducted on a group which included sports department students doing sports professionally, FI in men was determined to be 40%, and it was 34% in women (unpublished study). It was understood that FI, which is an indicator of anaerobic endurance, showed similarities between studies12. In this study, where FI values were estimated in watt, FI percentage values were determined to be 86% in the first measurement and 73% in the second measurement. These FI values, gathered in the RAST test that is applied by a different protocol than Wingate test, are notably higher than the average. Similar to the study of Koz and Taşdemir (2009), these results prove that our ice hockey national team players are considerably behind of national team players of other countries in terms of performance. However, FI values at the end of the short-term camp period showed decrease, although statistically insignificantly.

In a study which investigated maximal heart rate in different running speeds in trained athletes in 3 different age groups, significant differences were found in maximal heart rates in all 3 groups (p <0.01) (Yamaji et al. 2008). In another study conducted by Kitamura et.al (1991), heart rate and oxygen consumptions were scrutinized however no significant differences were observed. In this study, when two measurements were compared no significant difference was found between speed and VO2max values (p>0,05), significant differences were found between the two measurements in heart rate values during maximal stress (p<0,05).

Based on data obtained from modified Bruce protocol applied to 11 women college hockey team players, there was no significant relationship found between VO2max and fatigue values (p>0,05). Based on this result, it was suggested that aerobic training application to hockey players is not considerably necessary, and that interval trainings made in high intensity are sufficient to improve VO2max (Carey et al. 2007, MacDougal et al. 1998). As a result of this study, it can be stated that aerobic trainings made during the 15-day camp period are not sufficient to develop the characteristics desired during this period.

In their study, Wadley and Rossignol (1998) were not able to find a significant difference between VO2max values that they determined by 12x20m sprint running. It is thought that the reason behind this result is the increased lactic acid level because of very short recovery intervals. In this study, 35-meter race track was run 6 times in 10 second intervals and in the applied the RAST test results were obtained similar to the ones obtained in the above mentioned study.

CONCLUSION

Although it was accepted in the study we conducted that short-term camp periods were not sufficient for aerobic endurance development as is known in the literature absolutely, sports clubs and federations plan their camp activities for such short terms. We have shown once again based on such study results that trainings made decrease heart rate in maximal running speed however 15-day training period

was not sufficient to improve aerobic and anaerobic performance, and we attempted to illustrate scientifically once again that national teams will not benefit from these short term camp trainings.

REFERENCES

Astrand, P.O. & Rodahl, K. (1986). Textbook of Work Physiology. Newyork: McGraw-Hill Book.

Bompa, T.O. (2003). *Theory & Methodology of Training*, Hunt publishing.

Carey, D.G., Drake, M.M., Piliego, G.J. & Raymond, R.L. (2007). Do hockey players need aerobic fitness? Relation between V02max and fatigue during high-intensity intermittent ice Skating. *J Strength Cond Res. 21*, 963-966.

Costill, D.L., Thomason, H., Robert, E. (1973). Fractional utilization of the aerobic capacity during distance running. Med Sci Sport Exer, 5: 248-52.

Cox, M.H., Miles, D.S., Verde, T.J., & Rhodes, E.C. (1995). Applied physiology of ice hockey. *Sports Med 19,* 184-201.

Ergen, E. (2007). *Exercise Physiology Text Book*. Ankara. Nobel Publishing.

Hare, D. (1982). *Principle of Sports Training*, Berlin.

Kitamura, K., Toriumi, K., Nunomura, T. & Horita, T. (1991). Relationship between HR and VO2 during steady-state and unsteady-state exercise. *Jpn J Phys Fitness Sports Med 40*, 372-373.

Koşar, N.Ş. & Hazır, T. (1996). Reliability of Wingate anaerobic strength test. *Journal of Sports Sciences 7,* 21-30.

Koşar, N.Ş. & Kin İşler, A. (2004). Wingate anaerobic performance profile and gender differences of university students. *J Sport Sci 15,* 25-38.

Koz, M. & Taşdemir, G. (2009). Performance characteristics of Turkish national team male players. *Sports Sciences of Clinics of Turkey 1,* 67-70.

MacDougall, J.D., Hicks, A.L., MacDonald, J.R., McKelvie, R.S., Green, H.J. & Smith, K.M. (1998). Muscle performance and enzymatic adaptations to sprint interval training. *J Appl Physiol 84,* 2138- 2142.

Maud, P.J. & Shultz, B.B. (1989). Norms for the Wingate anaerobic test with comparison to another similar test. *Res Q Exercise Sport 60,* 144-151.

Montgomery, D.L. (1988). Physiology of ice hockey. *Sports Med 5,* 99-126.

Wadley, J.G., Le Rossignol, P. (1998). The relationship between repeated sprint ability and the aerobic and anaerobic energy systems. *J Sci Med Sport 1*, 100-110.

Yamaji, K., Guchi, F. & Hashizume, K. (2008). Assessment to running speed at predicted maximal heart rate in trained runners. *Adv Exerc Sports Physiol 13,* 101-106.

Zahner, L., Puder, J.J., Roth, R., Schmid, M., Guldimann, R., Pühse, U., Knöpfli, M., Braun-Fahrländer, C., Marti, B., Kriemler, S. (2006). A school-based physical activity program to improve health and fitness in children aged 6-13 years (Kinder-Sportstudie KISS): study design of a randomized controlled trial. *BMC Public Health 6,* 147.