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The Study of Physiological Factors of Hockey Players - Related To Training Time

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Abstract – ***The purpose of this research was to investigate the rest value and post exercise situation (5, 30, 60minute) of athletes with heart rate, oxygen consumption, and blood lactic acid. The objectives for this research were 20 volunteer Hockey players, from Barkatullah University's division I and II Hockey players, whose average age was 21.6±1.83 years, average weight was 79.6±8.05 kg, and average height was 184.5±4.19 cm. During experiment, each subject rode the bicycle until completely exhaustion at a speed of 60 RPM and power of 150W that will increase by 30W for every two minutes until they feel totally exhausted. Observed the changes of heart Rate ,oxygen consumption and blood lactate from the physiological biochemical serum specimens when the players were in resting state and recovery state after exercising (5, 30, 60 min.). The indices were measured by the Polar heart rate recorder, Vmax29 analytical instrument, and blood lactate acid analytical instrument (YSI2300). All the information was analyzed by a single factor which changed and explained by the Schffee' way, and the results as follow:***

1. There was a significant difference between division I and division II with the heart rate (174.4±7.9 vs. 186.4±4.5 bpm , P<.05).

2. There was a significant difference between division I and division II with the heart rate in the post-exercise 30 minute(83.6±3.8 vs. 97.7±8.0 bpm, P<.05).

3. There was a significant difference between division I and division II with the oxygen consumption maximal(55.4±1.1 vs. 48.7±1.7 ml/kg/min, P<.05). It was useful and helpful for the player and coach to manage the peak performance and to avoid the over training. It's is important for the coach and he player to recover quickly and to keep a steady state.

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INTRODUCTION

Most elite sport scientist tried to find out the useful and helpful training methods for the player are to promote the peak performance in the hockey and get the champion between training period and competition. Thus, it's very important concept for the coach and player to control and improve the training project and ability in the training season and competition. Hagberg(1984)showed that blood lactic acid, while still important from the exercise physiologist's viewpoint, now is known to contribute much less than originally believed to the regulation of man's physiological responses to exercise. Martin, Robert, Ro bertson,& Lephart(1998) showed that lactate metabolism and its rate of elimination from blood and muscle are important components of recovery following maximal exercise. Therefore, it has been well documented that performing low-intensity aerobic exercise (active recovery) during the immediate post-exercise period is more effective in accelerating lactate clearance than that in inactive rest (passive recovery).

Lin(2000) reported that an upper limit for oxygen consumption exists for each person. Like choosing of athletes, severe training for competitions, each part of the proceeding developments of competitive exercise is closely related and is as equal as any other part. Thus, researchers of physical science tried to find out all kinds of bio-characteristics of athletes in distinct ways to reach the most effective training. During exercise training, it is quite important to increase or decrease the quantity of exercise according to the regularity of dynamic changes in athletes in order to prevent them from excessive exercise training or unbearable load. On the other side, on the eves of competitions, especially in important competitions. To make them be in the best situation. Therefore, we employed laboratory tests to evaluate the variation of heart rates, oxygen consumption, blood lactate acid between rest and 5, 30, 60 minutes in the post exercise for hockey player of Division I and Divisor II.

METHODS AND PROCEDURES

Study subjects From Barkatullah University, Bhopal (Division I) and Division II college, 10 male contestants of hockey player in each group were voluntarily enrolled into this study during their training. The basic characteristics of these subjects were listed in Table 2-1:

Table 2-1: The basic characteristics of study subjects (N=20)

	Height (cm)	Weight (kg)	Age (year)	Training duration (year)	level
Division I	181.5±3.5	80.3±5.0	21.2 ±0.5	6.5 ±0.9	College Games
Division II	180.0 ±4.8	72.6 ±7.08	18.16 ±0.4	5.0 ±1.0	College Games

STUDY TIME AND SITES

This study started in March and ended in November, 2003. All laboratory tests were performed in the Physiology Laboratory of Bhopal

DESIGN OF EXPERIMENT

During experiment, each subject rode the bicycle until completely exhaustion at a speed of 60 RPM and power of 120W that will increase by 30W for every two minutes. The investigation was mainly on the variations during the rest period and the three recovery periods after exercise (5th, 30th and 60th minute). Wireless heart recorder(POLAR), Vmax29 gas analyzer and YSI2300 lactic acid analyzer were used to analyze heart rate, oxygen consumption and blood lactic acid.

Draw their blood to measure their serum biochemistry figure in resting state, 5 , 30 ,60 min. post-exercise, and then observed the differences. Each serum biochemical figure of the subjects, including heart Rate, oxygen consumption and blood lactate acid should be measured on each stage.

STUDY EQUIPMENT AND INSTRUMENTS

The following items were utilized in this research:

- SENSOR MEDICS Vmax29 Gas Meter
- YSI2300 PLUS Lactate Analyzer
- 586 PIII computer and Laser printer
- (POLAR) Mobile heart rate recorder
- Stopwatch
- Hygrometer

STATISTICAL ANALYSIS

ONE-WAY ANOVA and repeated Schffee' way were used to analyze if any significant variations of heart rates, oxygen consumption, blood lactate acid between rest and 5, 30, 60 minutes in the post exercise with division I and II . The level of statistical significance was set at P<0.05.

RESULTS AND DISCUSSION

The physiological biochemistry changes of heart rate(HR), oxygen consumption(VO2) , blood lactate acid(BLA) were the three parts to be observed when the athletes are in recovery after the load of exercise training. Their effects to exercise training are also observed:

1. ASSESSMENT OF CARDIO RESPIRATORY FUNCTION

(a.) The result of heart rate

There was a significant difference between division I and division II with the heart rate (174.4±7.9 vs. 186.4±4.5 bpm, P<.05). There was a significant difference between division I and division II with the heart rate in the post-exercise 30 minute(83.6±3.8 vs. 97.7±8.0 bpm, P<.05). Division I player recovery quickly than division II. The elite athlete could recovery quickly to rest state and have low heart rate. The elite athlete could recovery quickly to rest state and have low heart rate. Heart rates of general athletes at rest, before and after exercise, were 71, 59, 36 time/min, and their maximum heart rates were 185, 183, 174 time/min, respectively(Jack & David, 1999).

The average HR of the general public in resting state was about 72 times/min., and the subjects in the research is about 66.6-68.0 times/min., which, lowered than normal average, meaned the better faculty than average (Lin,2000). Heart Rate, usually, increases when exercising or being weary; however, heart rate and exercise quantity was direct proportion. Heart rate was also affected by , training season, training quality and strength, age, gender, eating habits, temperature, emotion, etc. Therefore, a person with poorer faculty may has higher heart rate than one with better faculty. Most athlete had prefer recovery ability in the training season and competition(Table3-1)(Figure3-1).

Table 3-1: The heart rate of training time with division I and II n=20 unit: time/min

time/item	Rest	HR max	P5	P30	P30
Division I	69.0±0.2	174.4±7.9	116.6±16.4	83.6±3.8	76.2±5.2
Division II	71.5±0.9	186.4±4.5	134.8±4.31	97.7±8.0*	83.0±7.0

*p<.05.

Figure 3-1: The heart rate of the division I and II on the hockey player

(b.) The Result of Oxygen Consumption

There was significant difference between division1 and division2 with the oxygen consumption maximal(55.4±1.1 vs. 48.7±1.7 ml/kg/min , P<.05)(Table3-2)(Figure3-2). It showed division I

player with VO 2max higher than division II. Bompa(1999) discussed to maintain good performance throughout the competitive phase and this physiological base must be maintained. The determination of physiological variables such as the anaerobic threshold(AT) and maximal oxygen uptake(VO 2max) through incremental exercise testing, and relevance of these variables to endurance performance, was a major requirement for coaches and athletes(Bentley, Mcnaughton, Thompson,& Batterhan,2001). Based on the results of previous research, it was suggested that male and female contestants with VO 2max of 65 ml/kg/min and 55 ml/kg/min respectively, had a better chance to win the Olympic medals. Intensive aerobic training could improve the physiological functions of highly trained sport contestants (Cooke et al., 1997).

Table 3-2: The oxygen consumption of training time with division I and II unit: ml/kg/min

time/item	Rest	HR max	P5	P30	P30
Division I	3.8±0.4	46.8±1.5	20.7±0.9	5.9±0.3	4.2±0.1
Division II	3.7±0.2	42.4±2.1 *	21.0±1.1	5.9±0.4	4.2±0.1

*p,.05.

Figure 3-2: The oxygen consumption of the division I and II

2. THE RESULT OF BLOOD LACTIC ACID

There was no significant difference between division I and division II (6.9 vs. 6.4 mmol/l, p>.05). Jack & David (1999) found that the resting blood lactate are 1.0 and 1.1 mmo/l respectively for ordinary athletes, and international athletes before and after exercise; maximum blood lactate are 7.5,8.5, 9.0 mmo/l respectively. Martin, Robert, Ro bertson, Lephart(1998)showed lactate metabolism and its rate of elimination from blood and muscle are important components of recovery following maximal exercise. Liang (1989) pointed out that if the performance becomes better when exercising with full speed, the concentration of blood lactate acid may increase, which is the enhancement of anaerobic of carbohydrate.

Table 3-3: The blood lactate acid of training time with division I and II unit: mmol/l

time/item	Rest	P5	P30	P30
Group 1	0.6±0.1	6.9±0.6	3.3±0.1	1.2±0.1
Group 2	0.7±0.0	6.4±1.2	3.4±0.1	1.4±0.1

*p<.05.

Figure 3-3: The blood lactate acid of the division I and II

CONCLUSIONS

1. There was a significant difference between division I and division II with the heart rate (174.4±7.9 vs. 186.4±4.5 bpm, P<.05).

2. There was a significant difference between division I and division II with the heart rate in the post-exercise 30 minute (83.6±3.8 vs. 97.7±8.0 bpm, P<.05). Division I player recovery quickly than division II.

3. There was a significant difference between division I and division II with the oxygen consumption maximal (55.4±1.1 vs. 48.7±1.7 ml/kg/min, P<.05). Division I player higher than division II with the oxygen consumption.

To excellent athletes, if the quality and quantity of training intensity, cardio respiratory function, energy consumption, and blood lactate system during training can be well controlled, furthermore to well control their body weight and physical ability, the athletes can elaborate their potential and maintain peak performance. It is very important to coaches and athletes (Hiroyuki et al., 1999). To monitor the physiological characteristic between training and competition period. It's benefit for the player and coach to manage the peak performance and avoid the over training. It's useful help and sport science's reference for the coach and player to the training project.

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