Aerobic and Anaerobic Capacity of Field Hockey Players

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ABSTRACT

This study aims to address a gap in the literature by profiling the physiological characteristics of young field Hockey players. The research was conducted on 24 boys and 24 girls of field Hockey team at SAI Training Centre, NSNIS, Patiala. The participants were subjected to a 20 m. shuttle run test (Beep test) for indirect evaluation of VO_2 max. RAST was conducted to assess anaerobic power of the Hockey players. Significant relationship was observed in aerobic capacity, maximum heart rate and recovery heart rate. Its shows that higher aerobic capacity, faster the recovery of heart rate in first minute of recovery in boys.

KEYWORDS

Anaerobic Power, VO_2 max, Beep Test, Field Hockey, RAST, Recovery heart rate.

INTRODUCTION

Field Hockey is an intermittent sport played by males and females of all ages, around the world. Despite the popularity of the game, relatively little is known about the physiological and match performance characteristics of field Hockey players. There is very little literature pertaining to the development of the physiological characteristics and match demands on young Hockey players(Reilly T., A.Borrie 1992). Currently there is a lack of research examining the physiological and match performance characteristics of field Hockey players, particularly with reference to young players.

Despite field Hockey's global popularity, little is known about the physiological characteristics required for elite level play, or how these develop in elite players from junior to senior level. Such insight is important in talent detection, identification, development and selection of players. While it has been suggested that to compete at Hockey's highest level, players must possess certain physiological, psychological, technical and tactical characteristics (Elferink-Gemser, 2011), these are yet to be clearly defined. To date, the physiological requirements of Hockey have perhaps received most attention in the literature.

This study aims to address this gap

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in the literature by profiling the physiological characteristics of young field Hockey players. Hockey matches are 70 minute in duration and players have been reported to complete around 1000 changes in activity (approximately once every 4 s) (Lothian & Farrally, 1992) with female players reported to cover up to 9.5 km (Gabbett, 2010) over the course of a match. Based on the literature, the majority of activity may be classified as low intensity in nature with periods of high intensity superimposed.

There is a great variety of field tests which measure the physiological characteristics of field Hockey players. One of the well-known and widely used functional tests for indirect evaluation of VO_2max is the 20 m. shuttle run test (Beep test).

Anaerobic performance is obviously relevant to sprinters, but also to those who play team and individual sports where there is an anaerobic component such as Weightlifting, Judo, sprinting in Football or Hockey (Withers, 1977).

The Scheme of SAI Training Centre is to nurture junior sports talent scientifically, who had attained excellence at Sub Junior level and induct them into the STC, for further scientific and in-depth coaching on a long term basis.

The practical problem in dealing with young athletes is that it is still questionable, how much training is optimal to bring about the desired physiological responses, without causing musculo-skeletal problem or easy burn out. Hence, there is a necessity to try and attempt to investigate the physiological status of these talented children, after the selection, on the basis of specific and general training, at an early age.

METHODOLOGY

The research was conducted on 24 boys and 24 girls (Total (N=48) of field Hockey team at SAI Training Centre. The informants had preliminary knowledge of the design and the goal of the experiment and were asked to fill an informed consent form, in advance. The participants were subjected to a 20 m. shuttle run test (Beep Test) for indirect evaluation of VO_2 max. The test was concurrently performed by all the informants. The Beep Test included a maximum of 20 m. dashes /running stages/, whose number was gradually increased. Each running stage implies the overcoming of the respective number of dashes for a limited period of time which remained the same throughout the experiment. The running speed for the onset level is 8.5 km. per hour and increases by 0.5 km. per hour for each subsequent level. The prediction of VO_2 max is based on the maximum aerobic speed achieved as well as the age of the informants/ calculated in years/, while the evaluation itself takes into account the highest level registered during the test, the number of dashes overcome before the moment when the athlete is unable to sustain the tempo in accord with the

sound signals. RAST was conducted to assess anaerobic power (Adamczyk, 2011) of the Hockey players. The software package SPSS version 20 n was used for the analysis of the data.

RESULTS & DISCUSSION

Present study was conducted on boys and girls of SAI Training Centre. Table 1 shows the physical parameters of the Scheme children. It has been observed that the mean age of the boys was 14.35 (±1.53) .The mean height of boys was 168.95 cm (±7.99) and Weight 55.45(±8.79) kg .The mean age of girls was 15.96 (±2.93) cm. The mean height of the girls was 155.36 cm (±6.36) and Weight 45.65(±7.49) in kg Table-1).

Mean Body mass index of boys was 19.31 (±1.93) while of female was 18. 27 (±2.11) cm. HWR of boys was 44.46 (±1.30) while of female was 43.57 (±1.45) cm.

Table-1: Mean and Sd of Physical Parameters of Male and Female Hockey Players

Parameter	MALE		FEMALE	
	MEAN	SD	MEAN	SD
Age (years)	15.35	1.53	15.96	2.193
Height (cm)	168.95	7.99	155.36	6.36
Weight (kg)	55.45	8.79	45.65	7.49
BMI	19.31	1.93	18.87	2.11
HWR	44.46	1.30	43.57	1.45

Table-2: Mean and Sd of Physiological Parameters of Male and Female Hockey Players

PARAMETERS	MALE		FEMALE	
	MEAN	SD	MEAN	SD
Anaerobic Power	323.62	80.30	217.22	47.07
Fatigue Index	6.11	2.88	1.91	0.60
Aerobic Capacity	53.15	5.00	40.58	3.50
Maximum HR	205.73	1.61	199.81	5.87
REC Heart Rate	162.03	13.85	180.18	9.18

Maximum Anaerobic Power output is found 323.62 (±80.30) in boys and while in girls 217.22(±47.07). Fatigue index is found 6.11 (±2.88) in boys and 1.91 (0.60) in girls. The reason for having higher anaerobic power values in the males rather than the females is that the males are more advantageous for muscle mass, muscle fibre, type, dimension and electro-mechanical aspects rather than the females. Also, the male's capacity for using glycogen is higher than the females; this makes males more favourable (Jacobs, 1986) and the analysis of a verity of state level Australian sportsmen,

Withers et al (1977) found that Hockey had relative anaerobic power of 15.2 W kg-1. The anaerobic power of Indian Hockey players was found lower than that of their international counterparts. As anaerobic power was important for the game of Hockey, Indian players should improve their power to achieve success in the International competitions.

Aerobic capacity (VO_2), is found 53.15 (±5.00) ml/kg/min in boys and 40.58 (±3.50) ml/kg/min in the girls. Maximum heart rate is found 205.73 (±1.61) bpm in boys and 199.81 (5.87) bpm in the girls. Aerobic capacity certainly plays an important role in modern field Hockey and has a major influence on technical performance and tactical choices. The VO_2max values of Indian Hockey players exhibit variation in different age categories.

Therefore, it appears that the VO_2max values of the elite Indian Hockey players were less than those of their international counterparts, which may be one of the reasons for their limitations in the International arena. This indicates that during aerobic exercise the demand of oxygen increases at the working muscle, so an optimum level of haemoglobin is required to perform at the highest level with high intensity (Aziz A.R. et al, 2000) Therefore, the increase in VO_2max demands higher rate of supply of oxygen.

Maximum heart rate is found 205.73 (±1.61) bpm in boys and 199.81 (5.87) bpm in the girls. While recovery heart rate is found 162.03 (±13.85) bpm in boys and 180.18 (9.18) bpm. Heart rate increases with an increase in work intensity and shows linear relationship with work rate (Bogdamis G.C. et al, 1995). The highest rate at which the heart can beat is the maximal heart rate (HRmax). Quick recovery from strenuous exercise is important in Hockey which involves intermittent efforts interspersed with short rests.

Table-3: Relationship Between Anaerobic Power, BMI and HWR Fatigue Index in Female Hockey Players

	BMI	HWR	FATIGUE INDEX
Anaerobic Power	0.391*	-0.474*	-0.821**

* Correlation is significant at the 0.05level
* Correlation is significant at the 0.01 level

Significant relation was observed in anaerobic power and body mass index. This shows that body mass index plays important role in anaerobic power. Significant co-relation was also observed in anaerobic power, fatigue index.

Table-4: Relationship Between Maximum Aerobic Capacity and Heart Rate in Boys

	REC HR (bpm)	Max HR (bpm)
VO_2 max (ml/kg/min)	0.619**	0.466**

* Correlation is significant at the 0.01level

Significant relationship was observed in aerobic capacity, maximum heart rate and recovery heart rate. Its shows that higher aerobic capacity, faster the recovery of heart rate in first min of recovery in boys.

Same in the case of girls, results show significant relation between aerobic capacity recovery heart rate and maximum heart rate. This shows faster recovery of those girls which are having larger aerobic capacity.

CONCLUSION

It is therefore reasonable to postulate that an individual with higher aerobics fitness will possess a greater capacity to deliver oxygen to working muscles, which in turn will lead to a greater and quicker recovery.

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