Evaluation of Physiological Responses During Recovery Following High and Moderate Exercise in Field Hockey Players

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Hockey is one of the team sports that require a high level of physical effort, so it is essential to determine the training load and recovery periods to avoid the overload problems. The researcher aimed to identify the recovery rates of the cardio-respiratory system following high (speed endurance) and moderate (cardio-respiratory endurance) intensities sessions in international and national field hockey players. Recovery rates, vital capacity , heart rate , systolic blood pressure , rate of cardiac muscle consumption , and efficiency of the circulatory system were measured over 15 minutes recovery period The results showed that the recovery rate for the international level players was much better than the players of the national level after both sessions. The researcher concluded that the recovery rates for the measured physiological parameters are faster in the elite international players than the national players. This observation would help in designing the training programs for different trained populations.
Keywords: Field hockey – specific training – recovery rates

Introduction:

Field hockey is one on the team sports that are characterized with a very special nature due to dealing with a stick, a ball and team mates as well as opponents which is considered to be a load on the hockey player who needs to be completely fit to fulfill the needs of this quick strong team game. This would be available if training is planned in a way that makes the player ready for the challenge inside the field.

Recovery and recovery periods are one of the most important factors in setting a training plan as hockey is one of the team sports that require high physical effort.

Aziz et al (2006) mentioned that for endurance sport athletes, during the intervening recovery periods of an aerobic interval training session, coaches have traditionally used the HRrecoverymethod of allowing HR to return to between100 and 140 beats min–1 before commencing the subsequent intervalsParrado (2010) proved that perceived tiredness predicted the autonomic

cardiac response to competitive overload. Thus, the perceived tiredness assessment would be a good early marker of fatigue and overload states during competition.

Indranil Manna et al (2011) agreed with Gordon (2011) where they both confirmed that field hockey players have to cover a large area during attack and defense, the game demands aerobic as well as anaerobic fitness, in addition to what can be described as athletic explosiveness.

Tessitore (2007) stated that the preparation phase for a long competitive season (several months) is usually rather short (a few weeks) and often includes a higher frequency of training sessions (2 daily units). The intensity, duration, and frequency of the training sessions can place a heavy strain on biological systems so that the earlier sessions might compromise the working capacity of players during the coming sessions.

This might take place through editing the internal structure of the training session using serial training type or parallel training type putting into account the importance of recovery periods in both types so as to help in achieving

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the required goals in the shortest possible period.

The importance of recovery has been confirmed by many researches a long time ago as it is a major reason for keeping the best fit form in addition to the gradual increase in mastering techniques and tactics. Therefore, it is essential to determine the recovery rates for different trained populations in order to maximize the benefits of the training programs.

Aim of the research:

This research aims to identify the recovery rates for some cardio-respiratory variables following two types of specific training sessions "speed endurance and cardio-respiratory endurance" in international and national field hockey players.

Research procedures:

- Recovery rates, vital capacity, heart rate, systolic blood pressure, rate of cardiac muscle consumption, and efficiency of the circulatory system were measured over 15 minutes recovery period

- **Vital Capacity** was measured with BSPIR spirometer 400, **hart rate** was measured manually, and systolic **blood pressure** was measured with Rlester Diplomat Presameter

- Rate of cardiac muscle consumption was measured with the following equation:

$$\frac{heart\ rate * systolic\ blood\ pressure}{100}$$

- Efficiency of the circulatory system were measured with the following equation

$$\frac{heart\ rate * 100}{systolic\ blood\ pressure}$$

- Recovery rate was measured with the following equation:

Ahmed Mahmod Mohamed Ibrahim (2002)

Research method:

The researcher used the experimental method using pre and post measurements.

Research sample:

The research sample consists of 3 elite field hockey players and 4 national athletes , (n=7)

The experiment:

It was performed over 2 stages that were applied on both subjects simultaneously as follows:

1st day:

1. A pre measurement for the functional variables of the research: Heart rate – diastolic blood pressure – cardiac oxygen consumption rate – Vo$_2$max – the efficiency of the circulatory system – recovery coefficient.

2. The recommended components of the training program in the direction of "Speed endurance"

3. Applying the post measurement in the following order: before warm-up, after warm-up, after performing the whole session, then 1,2,3,4,5,10,15, minutes after the session.

4. After applying the session, the player wad instructed for a negative rest for 3 days.

5. The 1st day's program was applied on both players but with changing the direction of the training session to be "cardio-vascular endurance"

Results:

The recovery rate was slightly faster in the elite players following both the speed endurance and cardiorespiratory sessions. Throughout the 5 minutes of recovery following the speed endurance the recovery rate was 0.99.in elite players compared to1.02 in national players. While following the cardiorespiratory endurance session the recovery rate was 0.92.in elite players compared to0.94 in national players

Table (1)

The effect of specific training and the components of the training session on recovery rates for the research sample field hockey players in the direction of Speed endurance.

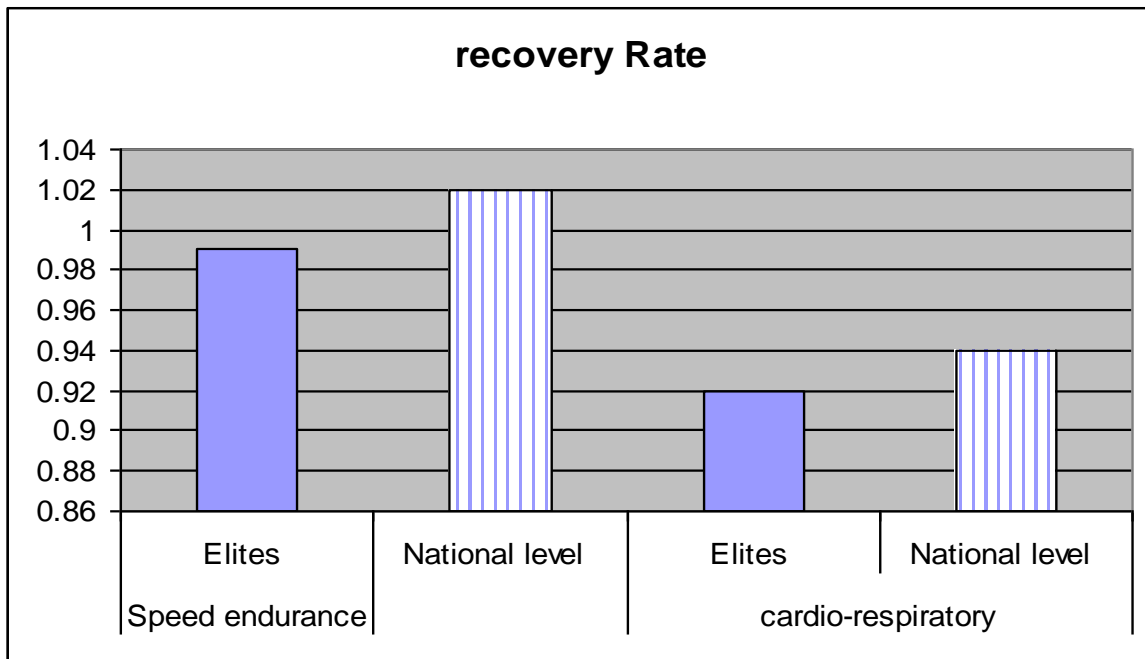| Variables / Measurements	Vital Capacity				HR				Systolic bloodPressure				Rate of cardiac muscle consumption				Efficiency of the circulatory system			
	Measurement		Percentage differences		Measurement		Percentage differences		Measurement		Percentage differences		Measurement		Percentage differences		Measurement		Percentage differences	
Sample	Elits	local	Elites	National level	Elites	National level	Elites	National level	Elites	National level	Elites	National level	Elites	National level	Elites	National level	Elites	National level	Elites	National level
Before warm-up	4600	4200	٨.٧٠ -	١٩.٠٥-	65	67	٨٤.٦٢	٨٠.٦٠	123	121	٥.٦٩	٨.٢٦	79.95	81.07	٩٥.١٢	٩٥.٥٢	15.85	17.18	٦١.٠٥	49,86
After warm-up	4200	3400	٣٥.٧١-	٣٨.٢٤-	120	121	٥٠.٠٠	٤٤.٦٣	130	131	١٩.٢٣	٢٢.١٤	156.00	158.51	٧٨.٨٥	٧٦.٦٥	52.53	25.74	١٠.١٦	٦.٨٨ -
After training session	2700	2100	١١.١١	١٩.٠٥	180	175	١٦.٦٧-	٧.٤٣ -	155	160	٩.٦٨ -	٦.٢٥ -	279.00	280.00	٢٤.٧٣-	١٣.٢١	28.13	23.97	٣.٠٣ -	٣.٩٦
After 1 min	3000	2500	١٣.٣٣	١٢.٠٠	150	162	١٢.٠٠-	١٣.٥٨-	140	150	٧.١٤٥-	٣.٣٣ -	210.00	243.00	١٨.٢٩-	١٦.٤٦-	27.27	24.92	٢.٩٨	٧.٩١ -
After 2 min	3400	2800	٥.٨٨	٧.١٤	132	140	٩.٠٩ -	٢١.٤٣-	130	145	٣.٥ -	٣٣.٤٥-	171,60	203.00	١٢.٥٩-	٢٤.١٤-	28.09	22.95	٤.٢١	١٥.٩١-
After 3 min	3600	3000	٨.٣٣	٦.٦٧	120	110	١٢.٥٠-	٤.٥٥ -	125	140	١.٦٠	٧.١٤ -	150.00	154.00	١١.١٠-	١١.٣٦-	29.27	19.30	٢٠.٢٨-	١١.٠٤-
After 4 min	3900	3200	٢.٥٦	٩.٣٨	105	105	١٤.٢٩-	٣.٨١ -	127	130	١.٥٧	٠.٠٠	133.35	136.50	١٢.٩٤-	٣.٨١ -	23.33	21.43	١٦.١٥-	١.٨١ -
After 5 min	4000	3500	٥.٠٠	٨.٥٧	90	101	١٦.٦٧-	٨.٩١ -	129	130	٦.٢٠ -	١.٥٤ -	116.10	131.30	٢١.٨٣-	١٠.٣١-	19.57	21.04	٦.٥٠ -	٨.٩١ -
After 10 min	4200	3800	٢.٣٨	٢.٦٣	75	92	٦.٦٧ -	٨.٧٠ -	121	128	٠.٠٠	٣.١٣ -	90.75	117.76	٦.٦٧ -	١١.٥٥-	18.29	19.17	٤.٣٣ -	١.٩٢
After 15 min	4300	3900			70	84			121	124			84.70	104.16			17.50	19.53		

N= 7 (3 elite players and 4 national players)

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Table (2)

The effect of specific training and the components of the training session on recovery rates for the research sample field hockey players in the direction of cardio-respiratory.

| Variables / Measurements	Vital Capacity				HR				Systolic blood Pressure				Rate of cardiac muscle consumption				Efficiency of the circulatory system			
	Measurement		Percentage differences		Measurement		Percentage differences		Measurement				Measurement		Percentage differences		Measurement		Percentage differences	
Sample	Elits	local	Elites	National level	Elites	Sample	Elits	local	Elites	National level	Elites	Sample	Elits	local	Elites	National level	Elites	Sample	Elits	local
Before warm-up	4700	4300	-١٤.٨٩	-٢٣.٢٦	66	68	٧٤.٢٤	٧٦.٤٧	122	120	٢.٤٦	١٠.٠٠	80.52	81.60	٧٨.٥٣	٩٤.١٢	16.10	17.00	٧٠.٠٩	٤٧.٠٦
After warm-up	4000	3300	-٣٠.٠٠	-٢١.٢١	115	120	٣٤.٧٨	٣٧.٥٠	125	132	١٢.٠٠	١٧.٤٢	143.75	158.40	٥٠.٩٦	61.46	27.38	25.00	٨.٨٦	٥.٧١ -
After training session	2800	2600	١٠.٧١	٣.٨٥	155	165	٩.٦٨ -	١٣.٣٣ -	140	155	٧.١٤ -	٧.٧٤ -	217.00	255.75	١٦.١٣ -	٢٠.٠٤ -	29.81	23.57	٢.١٠	١.١١
After 1 min	3100	2700	٦.٤٥	٣.٧٠	140	143	١٤.٢٩ -	١٣.٢٩ -	130	143	٣.٨٥	٢.١٠ -	182.00	204.49	١٠.٩٩ -	١٥.١١ -	30.43	23.83	٢٥.٦١ -	٨.٧٢ -
After 2 min	3300	2800	٦.٠٦	١٠.٧١	120	124	١٦.٦٧ -	١٢.٩٠ -	135	140	٥.٩٣ -	٣.٥٧ -	162.00	173.60	٢١.٦٠ -	١٦.٠١ -	22.64	21.75	٣.٩٩ -	٦.٣٣ -
After 3 min	3500	3100	٥.٧١	٣.٢٣	100	108	٩.٠٠ -	٥.٥٦ -	127	135	٠.٧٩	٣.٧٠ -	127.00	145.80	٨.٢٨ -	٩.٠٥ -	21.74	20.38	٦.٩٨٥ -	٢.١٥
After 4 min	3700	3200	٥.٤١	٦.٢٥	91	102	١٢.٠٩ -	١٠.٧٨ -	128	130	٢.٣٤ -	٤.٦٢ -	116.48	132.60	١٤.١٥ -	١٤.٩٠ -	20.22	20.82	٥.٨١ -	٠.٦٥ -
After 5 min	3900	3400	١٠.٢٦	٨.٨٢	80	91	٦.٢٥ -	١٢.٠٩ -	125	124	٢.٤٠ -	٢.٤٢ -	100.00	112.84	٨.٥٠ -	١٤.٢١ -	19.05	20.68	٦.٢٥ -	٣.٣٠ -
After 10 min	4300	3700	٤.٦٥	٨.١١	75	80	٩.٣٣ -	١١.٢٥ -	122	121	٠.٨٢ -	٠.٠٠	91.50	96.80	١٠.٠٨ -	١١.٢٥ -	17.86	20.00	٤.٨٠ -	٨.٩٧ -
After 15 min	4500	4000			68	71			121	121			82.28	85.91			17.00	18.21		

Fig (1)

The recovery rates for the research variables for both players in the direction of speed endurance and cardiospiratory direction

Fig (2)
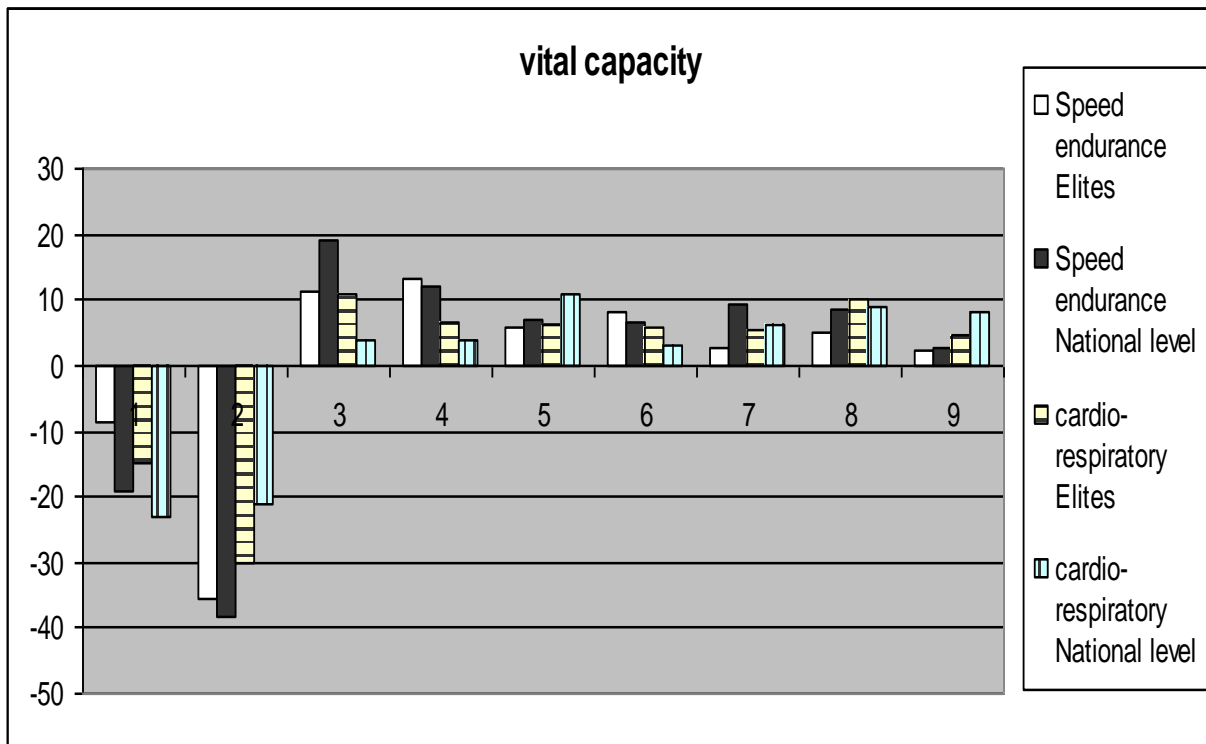
The vital capacity for the research variables for both players in the direction of speed endurance, cardio-respiratory endurance

Fig (3)
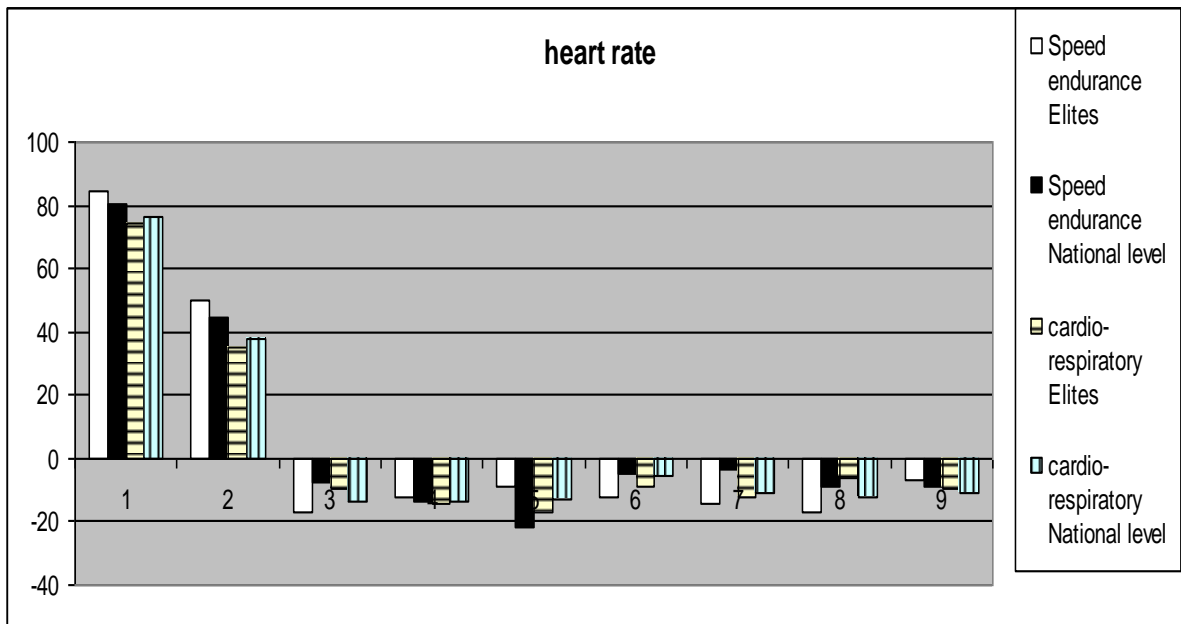
The heart rate for the research variables for both players in the direction of speed endurance, cardio-respiratory endurance

Discussions:

Table 1 and Fig 1 showed the presence of differences in the percentage rates for the research variables and when comparing the results of elite players and national players we find that there is a different effect for changing training direction on both players as in speed endurance, it was found that the international level players was quicker in returning back to normal state which means that the rate of recovery was higher than the national level players. This can be referred to the better adaptation of his functional systems which agrees with the findings of Salama B. (2000) and AbdElazeem T (1997).

Where table 2 and Fig 2 showed the presence of differences in the percentage rates for the research variables in the direction of cardio-respiratory endurance where it was proven that the international level players returns to normal state after 4 minutes where the national level player can be given extra training load after 5 minutes of recovery after taking the same load in the same prescribed training session.

These findings agree with what Vass (2011) mentioned when he said that there has been a large amount of research that has examined the relationship between cardiovascular fitness and recovery from high intensity exercise but it is so important to study the case per each team or individual sport so as to determine when to give athletes the next load without putting any strain on their biological systems.

Conclusions:

There is an effect for the direction of the specific training load where we should determine the rates of recovery as a response to this effect when planning for training.

Recommendations:

The directions of the training sessions for field hockey players should be determined prior to application in order to be able to identify the rates of recovery which will determine when the coach can apply an extra load on his players.

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