REVIEW OF RESEARCH

ANAEROBIC EXERCISE RESPONSE ON RECOVERY HEART RATE OFFOOTBALL PLAYERS

Dr. Bupesh S. Moorthy , Dr. P. Kulothungan and Dr. K. Sekarbabu

Assistant Professor, Department of Physical Education, Annamalai University, Chidambaram.

ISSN: 2249-894X
IMPACT FACTOR : 5.7631(UIF)
UGC APPROVED JOURNAL NO. 48514
VOLUME - 8 | ISSUE - 8 | MAY - 2019

ABSTRACT:

The aim of the present study was to examine the recovery heart rate response immediately after anaerobic exercise. To achieve the purpose of the study, 15 female football players who attended university coaching camp at Annamalai University, Chidambaram were selected. The age of the subjects ranged between 18 to 25 years as per university record. To assess the variability in recovery heart rate the heart rate was assessed at five different timesfor 30 seconds at 1:00 to 1:30, 2:00 to 2:30, 3:00 to 3:30, 4:00 to 4:30and 5:00 to 5:30 minutes after immediately cessation of 400 meters run. The collected data was analysed using One-Way Repeated Measure ANOVA for comparisons of mean values among five different times of recovery heart rate. When F is significant Scheffe's test was applied as post hoc test to determine the paired mean difference if any, among different times of the recovery heart rate. The value of 0.05 was set for statistical significance. The results of study showed that there was significant difference in recovery heart rateamong first recovery period,second recovery period, third recovery period, fourth recovery period, fifth recovery period as an acute response to anaerobic exercise.

KEYWORDS: *Anaerobic exercise, Heart rate recovery, heart rate variability, Female football players.*

INTRODUCTION

Anaerobic exercise is an exercise intense enough to trigger anaerobic metabolism. It is used by athletes in non-endurance sports to promote strength, speed and power and by body builders to build muscle mass. Muscles which are trained using anaerobic exercise develop differently, compared to aerobic exercise, leading to greater performance in short duration, high intensity activities, which last from more seconds up to about two minutes. Anaerobic training brings out changes in the ATP-CP and lactic acid system. Intensive anaerobic exercises lasting between 30 seconds and 3 minutes activate and exhaust the lactate system to its maximum; thus, the lactate system can be best trained by interval workouts (**Janssen, 2001)**.

Football is a complicated sports and performance depends on many factors such as training level, psychological situation, and player technique and team strategy (**Rosch et al., 2000)**. Soccer players may repeat high-intensity short-distance runs for a few times in series during the match **(Newman et al., 2004)**. Considering this skill's being developed, trainers use high-intensity exercises in their programs. Recovery mode is very important in determining the high-intensity training periods. So, recovery is vital for all players. Much more recovery may start during detraining. Here, there is a sensible balance between rest, recovery and detraining. The skill of individual recovery depends on rest break necessary between trainings. Older players need more recovery time than younger ones because physiological potential of young players is higher.

Recovery way is important in

determining the breaks of high-intensity runs. There are two basic metabolic processes in recovery time after a maximal exercise. These are renewal of phosphocreatine (PC) stores and acid-base equilibrium in muscles exposed to exercise **(Laursen&Jenkins., 2002).** Quite long-term recoveries are used to reach lower lactate level or lactate's going away from organism (**Draper et al., 2006)**. On the other hand, much more recovery doesn't contribute to support suitable levels in organism, so the training frequency doesn't seem to have been introduced as necessary in this situation and enough overloads doesn't take place to support performance.

Heart rate and myocardial spasms increase during run to supply active muscles with energy (**Kluess et al., 2000**). With finishing exercise, as a function of parasympathetic nervous system' stepping in heart rate decreases immediately after the exercise. Then, decrease in heart rate rises more and this may go down to the level before run, also this situation depends on the effect degree of sympathetic nervous system (**Arai et al., 1989)**. In last years, in some studies carried out, it has been reported that decrease in heart rate after exercise takes much longer time (**Cole et al., 2000)**. Therefore, in this study, it has been aimed to examine the heart rate recovery increasing in parallel with the anaerobic run.Thereare two established, noninvasive methods of detecting sympathetic withdrawal and parasympathetic reactivation in exercising participants: measurement of heart rate recovery (HRRec) and heart rate variability (HRV). The value of heart rate recovery is defined as the rate at which the heart rate decreases to a resting rate after cessation of moderate to heavy exercise **(Buchheit, Papelier et al., 2007)**. The main adaption for endurance training is increase in heart volume with normal thickness of ventricular cavity. Whereas for anaerobic training the adaptation is due to thickening of ventricular valve. The endurance training increases the aerobic power and as a result the recovery after exercise is faster.

METHODOLOGY

To achieve the purpose of the study 15 football players who attend university coaching camp at Annamalai University, Chidambaram were selected as subjects. The age group of the subjects was between 18 to 25 years as per university record. The study was intended to assess the response of anaerobic exercise on recovery heart rate Pre-exercise resting short-term heart rate variability (HRV) parameters in time and frequency domains were assessed during the first 30 seconds at five different times of recovery heart rate of the 30 seconds at 1:00 to 1:30, 2:00 to 2:30, 3:00 to 3:30, 4:00 to 4:30and 5:00 to 5:30 minutes for anaerobic trained Annamalai university football players.

STATISTICAL TECHNIQUE

The collected data was analysed using One-Way Repeated Measure ANOVA for comparisons of mean values between five different times of recovery heart rate. When *F* is significant Scheffe's test was applied as post hoc test to determine the paired mean difference if any. The value of 0.05 was set for statistical significance.

RESULT OF THE STUDY

Table I

The mean standard deviation values on exercise pulse rate, different time of the minutes recovery pulse rate of anaerobic exercise

Groups		Exercise pulse rate	1.00-1.30 minutes	2.00-2.30 minutes	3.00-3.30 minutes	4.00-4.30 minutes	5-5.30 minutes
Aerobic exercise	Mean	123.8	120.67	116.9	113.73	110.9	108.5
	S.D	4.53	5.32	5.44	4.83	4.46	4.68

The table I shows that the mean values on recovery pulse rate immediately after anaerobic exercise of 1.00 -1.30 minutes recovery pulse rate, 2.00-2.30 minutes recovery pulse rate, 3.00 -3.30 minutes recovery pulse rate, 4.00-4.30 minutes recovery pulse rate and 5.00-5.30 minutes recovery pulse rate are 123.8, 120.67, 116.9, 113.73, 110.9 and 108.5 respectively. The one way ANOVA of repeated measures was applied on recovery pulse rate for different time's recovery pulse rate and the results are presented in table-II.

Table - II

Summary of one way ANOVA of repeated measures on recovery pulse rate after anaerobic exercise

Source of Variation	SS	df	MS	F
A (Factor)	201067.407	1	201067.407	881.7
Error	319.259	14	22.804	
B (Tests)	2561.956	5	512.391	365.82
Error	98.044	70	1.401	

*Table value required for significance at 0.05 level with df 1, 14 & 5, 70 were 4.60 and 2.35 respectively.

There is a significant change in recovery pulse rate after performing anaerobic exercise at different phases of test. The obtained F ratio of 365.82 is greater than the required table value of 2.35 for the df 5 and 70. Since F ratio is significant scheffe'S post hoc test was applied.

Table III

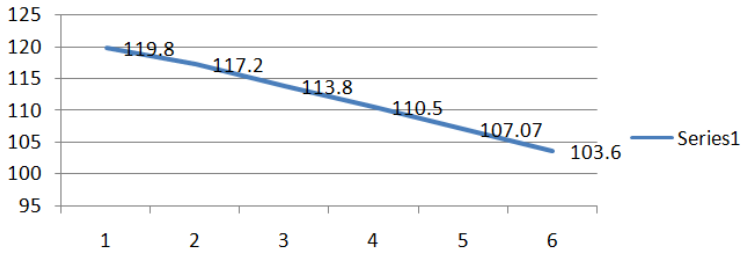
Table III Scheffe'S test for the differences among paired means of anaerobic training with different time on recovery pulse rate

Exercise pulse rate	1.00-1.30 minutes	2.00-2.30 minutes	3.00-3.30 minutes	4.00-4.30 minutes	5.00-5.30 minutes	Mean difference	Confidence interval
123.8	120.67					3.13	1.45
123.8		116.9				6.9	1.45
123.8			113.73			10.07	1.45
123.8				110.9		12.9	1.45
123.8					108.5	15.3	1.45
	120.67	116.9				3.77	1.45
	120.67		113.73			6.94	1.45
	120.67			110.9		9.77	1.45
	120.67				108.5	12.17	1.45
		116.9	113.73			3.17	1.45
		116.9		110.9		6	1.45
		116.9			108.5	8.4	1.45
			113.73	110.9		2.83	1.45
			113.73		108.5	5.23	1.45
				110.9	108.5	2.4	1.45

Table-III indicates that there was significant differences were observed on recovery pulse rate between and also among immediately after exercise, first, second, third, fourth and fifth cessation recovery period. The recovery heart rate was significantly reduced from one stage to other stage till the end of the recovery period.

Figure-I

Recovery heart rate of anaerobic football players at different times of the recovery period



DISCUSSION

The results of study showed that there was significant decrease in exercise heart rate among and between first recovery period, second recovery period, third recovery period, fourth recovery

period and fifth recovery period after high anaerobic capacity is associated with fast HR recovery after exercise. Results of previous studies suggest that autonomic adaptation to exercise varies depending on the training mode and type of exercise performed. Multiple studies have shown that HRRec improves with training in both sedentary and already trained subjects **(Otsuki et al., 2007)**. Other similar studies fourteen well-trained cyclists participated in a 4-week high-intensity training program and showed a significant increase in HRRec at 60 seconds after cessation of a maximal exercise test **(Lamberts et al., 2009)**. Other similar studies have observed a similar improvement in post-exercise HRRec after resistance training and further suggest that the mechanisms of post-exercise HRRec may be slightly different in strength (anaerobic) and endurance (aerobic) trained athletes **(Heffernan et al., 2007)**. As such, the purpose of the study was to compare the effect of a continuous training mode on heart rate recovery of trained track (anaerobic) and road (aerobic) cyclists at one and two minutes post-exercise.**McDonald et al., (2014)** conducted a study training mode showed statistically significant effects on the speed of heart rate recovery in trained cyclists. Greater variability in recovery heart rate at minute two versus minute one suggests that the heart rate should be monitored longer than one minute of recovery for a better analysis of post-exercise autonomic shift. **Taskin et al., (2014)**, conducted a studywhich, even if the increase of heart rate occurring after anaerobic run doesn't completely return to normal in 3rd minute of recovery, it will supply the athlete with a suitable condition for the second loading with regard to efficient rest. It is thought that a rest over 3 minutes should be given for athletes to make the heart rate after anaerobic run return to normal.

CONCLUSIONS

In summary, anaerobic runners indicated faster HR recovery after exercise and altered cardiac ANS modulation at rest than untrained controls. The higher levels of HRV, higher anaerobic capacity and exaggerated blood pressure response to exercise in the anaerobic runners are suggested to be responsible for their faster HR recovery after exercise. There was a significant reduction recovery pulse at each phases of recovery after anaerobic exercise.

REFERENCE

1. Arai, Y., Saul, J.P., Albrecht, P., Hartley, L.H., Lilly, L.S., Cohen, R.J. and Colucci, W.S. (1989) Modulation of cardic autonomic activity during and immediately after exercise. *American Journal of Physiology,* 256: H132-H141.
2. Cole CR, Foody JM, Blackstone EH, Lauer MS (2000.). Heart rate recovery after submaximal exercise testing as a predictor of mortality in a cardiovascular healthy cohort, Ann Intern Med 132(7):552-555,
3. Dieter Rosch, MA, Roy Hodgson, Lars Peterson, MD, Toni Graf-Baumann, MD, Astrid Junge, PhD, Jiri Chomiak, MD, Jiri Dvorak, MD (2000), Assessment and Evaluation of Football Performance, The American journal of sports medicine, Volume: 28 issue: 5_suppl, page(s): 29-39.
4. Draper, N., Bird, E.L., Coleman, I. and Hodgson, C. (2006). Effects of active recovery on lactate concentration, heart rate and RPE in climbing. Journal of Sports Science and Medicine, 5(1), 97–105.
5. Heffernan KS, Fahs CA, Shinsako KK, Jae SY, Fernhall B. (2007). Heart rate recovery and heart rate complexity following resistance exercise training and detraining in young men. *Am J Physiol-Heart*. 293:H3180–H3186.
6. Janssen P. Lactate Threshold Training.Champaign, IL: Human Kinetics, 2001; pp.1–150.
7. Kluess, .H. A. R. H. Wood, and M. A. Welsch, (2000). Vagal modulation of the heart and central hemodynamics during handgrip exercise. Am J Physiol Heart CircPhysiol 278 , H1648-1652.
8. Kluess, H.A., Wood, R.H. and Welsch, M.A. (2000) Vagal modulation of the heart and central hemo-dynamics during handgrip exercise. *American Journal of Physiology* .279, H1648-H1652.
9. Lamberts RP, Swart J, Noakes TD, Lambert MI. (2009). Changes in heart rate recovery after high-intensity training in well-trained cyclists. *Eur J Appl Physiol*. 105:705–713.
10. Laursen PB, Jenkins DG, (2002)The scientific basis for high-intensity interval training: optimising training programmes. Sports Med;32:53–73.

11. McDonald KG, Grote S, Shoepe TC. (2014).Effect of training mode on post-exercise heart rate recovery of trained cyclists.*J Hum Kinet*. 8; 41:43-9.
12. Newman MA, Tarpenning KM, Marino FE. (2004). Relationships between isokinetic knee strength, single-sprint performance, and repeated-sprint ability in football players, J Strength Cond Res. 18(4):867-72.
13. Otsuki T, Maeda S, Iemitsu M, Saito Y, Tanimura Y, Sugawara J, Ajisaka R, Miyauchi T.(2007). Postexercise heart rate recovery accelerates in strength-trained athletes. *Med Sci Sport Exer*. 39:365.
14. Taskin H, Erkmen N, Cicioglu I. (2014). The examination of the heart rate recovery after anaerobic running in soccer players. *CollAntropol*. 38(1):207-11.

Dr. Bupesh S. Moorthy
Assistant Professor, Department of Physical Education, Annamalai University, Chidambaram.