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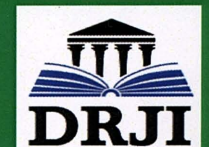
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## **Effect Of Periodized High And Moderate High Intensity Aerobic Training On Fatigue Index Among Premier League Soccer Players In Sri Lanka**

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### **Abstract:**

Soccer players have to sprint frequently and run in a high intensity mode with smaller rest period to tolerate the match demand to succeed a game. The objective of this study was to find out the effect of Periodized High and Moderate intensity aerobic training on Fatigue Index (FI). To achieve the purpose forty five (N=45) soccer players were selected from University of Jaffna, Sri Lanka, and their age were ranged between 20 to 24 years (RHR  $63 \pm 3$ ). The subjects were randomly divided in to three groups of fifteen each, group I underwent High Intensity Training [(HIT) (n=15, 50-60 min / day / three days / week over the period of twelve weeks)], group II underwent Moderate Intensity Training [(MHIT) (n=15, 50-60 min / day / three days / week over the period of twelve weeks)], and group III acted as control. Exercise intensity starts from 70 % and 80% of the maximum heart rate of the MHIT and HIT respectively. 2% rule was implemented in every two weeks. The Data were collected on Fatigue index by using sprint fatigue test before and after the intervention programme. Collected data were statistically analyzed by using dependent 't' test to find out the pre and post test different, and one way ANOVA, 0.05 level of confidence was fixed to test the significance. When the obtained 'F' ratio was significant, Scheffe's post hoc test was used to find out the paired mean difference. Results of this study reveal that, there was a significant ( $f=15.96$ ) difference between pre and post test mean of two experimental groups due the high and moderate high intensity training. However high intensity training ( $t= 8.18^*$ ) shows better improvement than Moderate high intensity training ( $t=3.21^*$ ). And scheeff's post hoc result reveals that, there was significant mean difference between High intensity aerobic training and moderate high intensity aerobic training, and High intensity aerobic training and control. From the results it was concluded that, high intensity training is better than moderate high intensity training on fatigue index. Hence it was recommended that that, High Intensity traditional based training is best to improve fatigue index to tolerate the extreme game demand during soccer match. Keywords: Aerobic, fatigue index, High Intensity Aerobic, Moderate High Intensity

## Introduction

Soccer is beautiful complex game which leads the peoples to sit on the pin point throughout the match. The physical and physiological work rate in a soccer match is very high and needs subsequent changes in sprinting, jogging, high intensity running throughout the game. Intensity and demand during soccer match increasing due to the advancement of the prodigious sports training inventions. Acclimatize to the demand of the competitions needs training modifications to tolerate extreme pressure during the competition. In a match, 70% of the times the players are jog/ walk, but the match is decided/ tempered by balance 20% high intensity running and 10% sprinting. Hence, the beauty of the soccer match and high work rate demands are endured by high intensity running and sprinting. Majority of the research reveals that the high intensity aerobic training enriches the quality of the game and increases the chances of winning the game. Therefore, the aim of this study was to find out how players get benefited from this training and the amount of training load necessary to improve speed endurance.

Endurance refers to the capacity of retaining performance quality in particular duration. The performance of endurance attributes to the central nervous system function, maximum oxygen uptake and the body's energy reserves and utilization. In several ballgames, skills, Physiological and physical performance of an individual player are the most important factors that contribute to the competitive success of a whole team. Physiological and physical changes are take place according to the energy based training. In respect to the physical performance the endurance requirements of contact games seems to be rather similar (Hakkinen, 1989, Viitasalo et al., 1987).

During the soccer game aerobic energy system works majority of the time, but the increased tempo and the pressure tolerate by anaerobic energy system. In soccer game player who sprint, run jump faster with smaller recovery period often dominate the game. So the players need to prepare according to the nature and energy system of the game. To succeed in tactical game plan players need to improve fitness. Therefore the traditional training for aerobic and anaerobic energy system with intensity controlled based may lead to good physical preparation. Achieving the fitness goals through practicing traditional Aerobic training may solely develop the main objective of the training.

The fatigue index is a concept used in the study of the development of fatigue during anaerobic exercise. Anaerobic exercise uses glycogen rather than oxygen for fuel. The index number indicates the rate at which an athlete's power output declines. It can be used as an indicator of an athlete's aerobic endurance. The higher the fatigue index, the lower your ability to maintain power over a series of sprints. During intense exercise, muscle and blood lactate can rise to very high levels. Lactate accumulation causes an increased concentration of hydrogen ions and corresponding acidosis, a primary factor in muscle fatigue. Athletes with high fatigue index numbers should train to improve lactate tolerance in order to promote quicker recoveries from explosive bursts of speed and power. Lactate tolerance training usually starts midway through the pre-season, after an aerobic base has been built with continuous or interval training (Pavlović, Mihajlović, & Radulović, 2015). Anaerobic capacity is the maximum amount of adenosine triphosphate that can be resynthesized via anaerobic metabolism (both alactic and lactic systems) during maximal exercise (Minahan, Chia, & Inbar, 2007).

## RESEARCH PROBLEM

Football is the definition of beauty. All over the world large numbers of peoples are watch, play and enjoy this game, because of the duration, fluidity and feasibility. Soccer game is decided and become highly tempered by frequent sprints and high intensity running. This type of physical exertion may fatigue the players and loose the pressure of the match. So adequate and appropriate training on physiological as well as physical variables may influence on soccer to become beautiful game. Fitness is important for all games especially football. In Sri Lanka, players are playing football as a game without appropriate training for fitness. According to FIFA standings, Sri Lankan football has been far behind compared to other Asian countries such as Maldives and Singapore. So prepare the players according to the demand of the match will be effectively produce globally challenging players. Therefore the present investigation intend to research on fatigue index among football players.

## OBJECTIVES OF THE STUDY

The research question was raised on endurance which essential for soccer players that lacks in Sri Lankan footballers. The common myth of the new ideology is that the university players are less fit and they are unable to reach high intensity heart rate rapidly during soccer match. Therefore the objective of the present study was intent to find out the Effect of periodized high and moderate high intensity aerobic training on Fatigue index among university soccer players.

**High Intensity Training:** HIT is the concept where one performs a short burst of high-intensity (or max-intensity) exercise followed by a brief low-intensity activity, repeatedly, until too exhausted to continue. (Wikipedia 2019). HIT requires that you perform 20 minutes or more, depending on your sports, at an intensity level well above aerobic threshold and the intensity at 90-95 percentage and ending 100% MHR. (Benson,R., and Connolly, D.2011). **Moderate high Intensity training:** MHIT means the work outs are practiced within the 75-85 percent maximum heart zone often called moderate high intensity training. Interval training is a type of physical training that involves bursts of high-intensity work interspersed with periods of low-intensity work. The high-intensity periods are typically at or close to anaerobic exercise, while the recovery periods may involve either complete rest or activity of lower intensity.

High intensity aerobic training is a form of cardiovascular exercise. Usual high intensity aerobic training sessions may vary from 9–20 minutes. These short, intense workouts provide improved athletic capacity and condition, improved glucose metabolism, and improved speed endurance.

The *fatigue index* is a measure of anaerobic capacity, or endurance. It is the rate at which power declines in each individual athlete; in other words, it signifies the rate at which tired the athletes when sprinting. The higher fatigue index leads the athletes to maintain power over a series of sprints. (Livestrong.com.2019) Hence the purpose of the study was to find out how the high and moderate high intensity aerobic training affect on fatigue index.

## Methodology

To achieve the purpose forty five (N=45) soccer players were selected from University of Jaffna, Sri Lanka, and their age were ranged between 20 to 24 years (RHR  $63 \pm 3$ ). The subjects were divided at random in to three groups of fifteen each, group I underwent High Intensity Training [(HIT) (n=15, 50-60 min / day / three days / week over the period of twelve weeks)], group II underwent Moderate Intensity Training [(MHIT) (n=15, 50-60 min / day / three days / week over the period of twelve weeks)], and group III acted as control. Exercise intensity starts from 70 % and 80% of the maximum heart rate of the MHIT and HIT respectively. 2% rule was implemented in every two weeks. The Data were collected on Fatigue index by using sprint fatigue test before and after the intervention programme. Collected data were statistically analyzed by using dependent 't' test to find out the pre and post test different, and one way ANOVA, 0.05 level of confidence was fixed to test the significance. When the obtained 'F' ratio was significant, Scheffe's post hoc test was used to find out the paired mean difference.

## RESULTS

**Table – I: COMPARISON OF PRE AND POST TEST ON FATIGUE INDEX OF HIGH AND MODERATE HIGH INTENSITY TRAINING AND CONTROL GROUPS**

Group		Mean	SD	SE	't'
Group I (HIT)	Pre	7.02	0.19	0.05	8.18*
	Post	6.33	0.25	0.06	
Group II (MHIT)	Pre	6.91	0.42	0.11	3.21*
	Post	6.77	0.30	0.08	
Group III Control	Pre	6.94	0.33	0.07	0.81
	Post	6.89	0.31	0.08	

\*Significant at .01 level of confidence. with df (1, 14) is 2.62

**Table II: ANALYSIS OF VARIANCE ON FATIGUE INDEX OF HIGH AND MODERATE HIGH INTENSITY TRAINING AND CONTROL GROUPS**

	High Intensity training	Moderate high Intensity training	Control Group	S o v	Sum of Squares	df	Mean squares	'F' ratio
Post test Mean	6.33	6.77	6.89	B	2.65	2	1.33	15.96*
SD	0.25	0.30	0.31	W	3.49	42	0.08	

\*table value at 0.01 level of confidence with (2,42) is 5.15

**Table III : SCHEFFE'S POST HOC TEST ON FATIGUE INDEX AMONG HIGH AND MODERATE HIGH INTENSITY TRAINING AND CONTROL GROUPS**

HIT	MHIT	Control	MD	CI
6.33	6.77		0.44*	0.32
	6.77	6.89	0.12	
6.33		6.89	0.56*	

\*at 0.01 level

Table I shows that there was a significant difference between pre and post test mean of two experimental groups due the high and moderate intensity training. However high intensity training ( $t= 8.18^*$ ) shows better improvement than moderate high intensity training ( $t=3.21^*$ ). The table II shows there was a significant difference between groups on fatigue index ( $f=15.96^*$ ). Hence the scheeff's post hoc result reveals that, there was significant mean difference between High intensity training and moderate high intensity training, and High intensity training and control.

### Discussion

High intensity running is mostly influence on soccer game and 20% of the total distance in a match covered by high intensity activity. So training for high intensity may contribute to enhance the ability to handle extreme game pressure. Trainers and coaches are straggling to achieve the training goals through the intensity based tactical preparation. So training in a traditional way of running with different proportion of intensity may contribute to succeed the training objectives. Currently, the maximum accumulated oxygen deficit (MAOD) is considered the gold standard to estimate anaerobic capacity. In addition to being sensitive to anaerobic training, MAOD is correlated with performance in high intensity efforts and it is used to validate other methods that evaluate anaerobic conditioning (Piliandis, Mantzouranis, Smirniotou, Zaggelidis, & Proios, 2016).

The fatigue index is a concept used in the study of the development of fatigue during anaerobic exercise. Anaerobic exercise consists of fast twitch muscle fiber activities such as sprinting, running high intensities and lifting weights that are rely on glycogen rather than oxygen for fuel. The fatigue index can be measured with a series of low distance sprints. The results can help the football coach to areas which need to focus training.

Many athletes attribute their success to interval training. With the spacing of exercise and rest periods, a tremendous amount of work can be accomplished that would not normally be completed in a workout in which the exercise was performed continuously. Repeated exercise bouts can vary from a few seconds to several minutes or more depending on the desired outcome. The interval training prescription can be modified in terms of intensity and duration of the exercise interval, the length and type of relief interval, the number of work intervals and the number of repetition blocks or set per work out.

Jan Percival concluded that every individual has different level of fitness, which may change from time to time, it may also change from place to place and sometimes it may changes with work or situation also. Physical fitness variables are very important to soccer player and form a condition for higher performance. The physical fitness components like strength, speed, endurance, flexibility and the various coordinative abilities are essential for a high technique and tactical efficiency. Depending upon the demand of the game, each factor of physical fitness should be optimally developed. The present study reveals that there was a significant difference on fatigue index between the High intensity training group and control group, also high intensity training group and moderate high intensity training group due to the effect of twelve weeks of high and moderate high intensity training.

### **Conclusion**

Hence it was concluded that High intensity training is essential to extend fatigue threshold level as well as ability to tolerate high pressure in game situation.

### **Recommendation**

Traditional High Intensity trainings have to include in training schedules to supports to the players to improve physiological status, ability to tolerate different positional demand and reduce fitness related injuries.

### **Implication**

High intensity aerobic training may effective when it applied with game / sport oriented training. Further advance scientific research needed for this study.

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