

# Effect of Continuous Endurance Training Versus Intermittent Endurance Training on Aerobic Capacity in Recreational Female Hockey Players a Randomized Control Trail

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**Abstract:** *The present research has been done with the aim of investigating the effect of continuous endurance training versus intermittent endurance training on aerobic capacity in recreational female hockey players of age between 16 – 20 is taken. The research method was randomised control trail with pretest and posttest, and included all recreational female hockey players Sripadmavati degree college in Tirupathi. Methodology: Thirty recreational hockey players participated purposefully and accessible in this study which randomly have been divided into two groups of continuous endurance training and intermittent endurance training. The instrument used to determine VO<sub>2</sub>max through one field and lab tests field test by name shuttle run test and lab test by name treadmill test. Data analysis method was descriptive statistics (mean and standard deviation) and inferential statistics (t-test and paired t-test) respectively. Results: On performing the paired t-test, there is a statistical significance ( $p < 0.00$ ) is existing between the pre and post intervention values of both the groups. Hence there is a significant improvement is seen in intermittent trained players. Conclusion: Research findings showed improvement of Vo<sub>2</sub> max in both the training group but significant improvement is seen mainly in intermittent endurance training than continuous endurance training.*

**Keywords:** continuous endurance training, intermittent endurance training, aerobic capacity, tread mill test, shuttle run test, hockey players

## 1. Introduction

The name “hockey” was derived from a French game “hoquet” which means “sheaperds scrook”. This was the game that was introduced into the sub continent by the British, now Indians have developed their own style game which under goes with 70 minutes of time duration<sup>5</sup>.

This is the game with team sport which goes on start and stop nature that runs with the following activities like jogging, dribbling of ball with multiple change of directions, sprinting activities e.t.c., hence the match consists of low to moderate intensity activities with out any interruption<sup>7</sup>.

Many studies have proven that the players in team sports covers at least 9-12 km with an high intensity running and player performs 1000 – 1400 short activities that are 19 – 62 sprints, high intensity running is approximately for every 70 sec, about 15 tackles, 50 activities with involvement of ball, 30 passes as well as changing pace & sustained forceful contractions to maintain balance and control of the ball against defense pressure<sup>23</sup>.

Because of this high intense activities the recreational players undergoes fatigue before reaching their goals. So, the players should mainly focus on their aerobic capacity which is improved by the endurance training<sup>1</sup>.

Endurance training is developed to improve the aerobic capacity which is performed to increase the cardiopulmonary capacity (VO<sub>2</sub>max). During this period the demand of oxygen is improved by the working muscle. The oxygen transport system is best trained by the endurance

workouts that is the exercises of relatively long duration at sub maximal level.

This specific training improves the ability to continue exercising for a prolong period and ability to quickly recover from high intensity exercises, increases the total distance covered throughout a match, increases work intensity during the game play and increases the number of sprints covered during the match.

Aerobic capacity is mainly improved by three methods of endurance training they are

- 1) Intensive endurance training
- 2) Intermittent endurance training and
- 3) Extensive endurance training

Each method is based on the training regimen and the practice intensity therefore continuous and intermittent regimens are properly used based on specific training targets.

Continuous training is aimed at improving aerobic power and local muscular endurance. In this training, work is done in a continuous manner with the maximum heart rate.

Intermittent training is set periods of training followed by set periods of rest which are repeated several times in one training session. This can be classified as short, intermediate and long intervals that was divided based on the rest to work ratio (or) duration. This both continuous and interval training is mainly meant to improve the aerobic power (or) capacity. Hence the main purpose of the study To know which shows the better effect to improve their aerobic capacity. Hence this study is taken to find out “The effectiveness of interval versus continuous endurance

training on aerobic capacity in recreational female hockey players.”

## 2. Method

Before starting the protocol the pre values of  $Vo_2$  max were taken through field and laboratory tests. Laboratory test was carried out by treadmill and field test were carried out by multiple stage shuttle run test ( beep test).field test is done in the ground of Sri Padmavathi degree mahila kalasala and lab test in SVIMS COP Tirupathi. The players are included with an age group between 17 – 20 years female recreational hockey players with a game history of at least 2 years with out any interruption and with normal physical condition. The players were excluded of Age group < 17 and > 20 years of age, players with any Cardio respiratory diseases, Musculoskeletal disorders, Neurological disorders, Players with hypertension and Recent fractures

The players who satisfies the inclusive criteria and exclusive criterion they are followed by pre test by one filed and one lab test the field test is by beep test or multiple stage shuttle run test. After the field test, lab test was conducted on the next day. This was performed on the treadmill.

The protocol was started after completing the field and lab test. The players were divided in to two groups, the groups were divided based on simple randomized sampling. Each group consists of 15 players. 1<sup>st</sup> 15 players in a continuous group and next 15 players in a intermittent group.

The protocol given for the continuous training group players are started with 10 min warm up that containing of joint movements i.e., free cervical, shoulder, elbow, wrist, hip knee and ankle movement, stretches like biceps, triceps, hamstrings, quadriceps and calf muscle stretch and fast walking. After the warm up the subjects were carried out with long slow distance running for 40 min after completing the slow walk the players were continued with cool down processes that contains of skipping for 5 min this was carried out for 6 week i.e., 3 successive sessions for a week.

The protocol given for the intermittent training group players were started with 10 min warm up that contains of the joint movements i.e., free cervical, shoulder, elbow, wrist, hip knee and ankle movement, stretches like biceps, triceps, hamstrings, quadriceps and calf muscle stretch and fast walking . After the warm up was completed the players were made to run up to marker cone that was placed at a distance of 68 meters with in 15 seconds and made the participants to take rest for 15 seconds and get back to the starting position in 15 seconds . This process is repeated for 5 minutes, next to 8 minutes for 2<sup>nd</sup> session and 10 minutes for 3<sup>rd</sup> session. In the 1<sup>st</sup> week only 2 sets were being performed and ended with a 5 min cool down process i.e., skipping.

For 2<sup>nd</sup> week the same protocol was repeated with an increased distance of about 72 meters. For 3<sup>rd</sup> week the distance was increased to 76 meters for 4<sup>th</sup> week it was increased to 79 meters, for 5<sup>th</sup> week the distance was increases to 83 meters and for the 6<sup>th</sup> week distance was raised to 86 meters. After completing the protocol again

field and lab tests were carried out to find the difference in vo2 max.

## 3. Discussion and Conclusion

In the present study out of 30 recreational female hockey players, 15 were selected for continuous endurance training and the other 15 were selected for intermittent endurance training. These two groups have undergone the protocol that was designed for 6 weeks.

Training groups	N	Mean	SD	t-value	p-value	
$Vo_2$ max ( CG )	Pre	15	46.49	1.604	47.740	0.000
	Post	15	60.81	1.383		
$Vo_2$ max ( IG )	Pre	15	46.93	1.639	11.744	0.000
	Post	15	54.09	1.670		

## 4. Results

Pre and post  $Vo_2$  max values of mean and standard deviation are  $46.49 \pm 1.604$  &  $60.81 \pm 1.383$  for continuous trained players where for intermittent trained players is  $46.93 \pm 1.639$  &  $54.09 \pm 1.670$  by these values we can find the significant improvement in both the groups but there is more improvement is observed in group-1 than the group-2 players.

### Inference

On performing the paired t-test, there is a statistical significance ( $p < 0.00$ ) is existing between the pre and post intervention values of both the groups.

The t-value of  $Vo_2$  max for group-1 is 47.740 where the t-value of vo2 max for group-2 is 11.744. The results in the above table shows that the aerobic capacity i.e.,  $Vo_2$  max of the intermittent endurance training players has significantly improved after 6 weeks ( $p < 0.05$ ) compared with the continuous endurance training players.

A similar study conducted by Kuno Hottenrott et al., in 2012 concluded that high intensity interval training was more effective in increasing relative peak oxygen up take. Although slight higher cardio respiratory benefit seems to be conveyed with high intensity interval training group. That shows significant improvement in  $Vo_2$  max values compared to contiuous training in female hockey players. This is because the endurance trained skeletal muscle fibers contains large and more numerous mitochondria. The mitochondria increase in size because of the endurance training to produce or to generate more ATP generally.

The results of the other studies done by Tabata et al., in 1996; Helgerd al., in 2007; Bayati et al.,in 2011, McPherson et al., in 2011 showed similar increase in  $Vo_2$  max in intense intermittent training than continuous training that is because during intermittent training, the volume of air inspired in a single maximal ventilation is increased, the diffused capacities also increased, facilitates the exchange of oxygen and carbondioxide. The muscle oxidation potential is also improved more with intermittent training compared to the continuous training. This was proved by the study done by Carl D Parton et al., in 2004 that the interval training at high intensity shows improvement in  $Vo_2$  max mainly during sub

maximal endurance performance (by 6 %) through improvements of all three components of aerobic capacity.

Training groups	N	Mean	SD	t-value	p-value	
Vo <sub>2</sub> max (CG)	Pre	15	53.66	1.005	54.055	0.000
	Post	15	65.87	0.871		
Vo <sub>2</sub> max (IG)	Pre	15	53.41	0.856	8.865	0.000
	Post	15	57.21	1.687		

## 5. Results

Pre and post Vo<sub>2</sub> max values of mean and standard deviation are  $53.66 \pm 1.005$  &  $65.87 \pm 0.871$  for continuous trained players where for intermittent trained players is  $53.41 \pm 0.856$  &  $57.21 \pm 1.687$  by these values we can find the significant improvement in both the groups but there is more improvement is observed in continuous group than the intermittent trained players.

### Inference

On performing the paired t-test, there is a statistical significance ( $p < 0.00$ ) is existing between the pre and post intervention values of both the groups.

The t-value of Vo<sub>2</sub> max for group-1 is 54.055 where the t-value of Vo<sub>2</sub> max for group-2 is 8.865.

The results of above table shows that with intermittent training there is an improvement of submaximal endurance performance. The aerobic power of these players was improved by increasing oxygen delivery to the skeletal and cardiac muscles through the greater capillarization which results in increase in stroke volume and cardiac output with the intermittent training group compared with the continuous training group.

A study done by Bayati et al., in 2011 showed that there was a progressive improvement of the energy production through aerobic system, increased oxygen delivery i.e., stroke volume, as well as the increased use of oxygen by the active muscle. This resulted in major improvement in aerobic capacity through high intensity intermittent training group<sup>4</sup>. A study done by Tjvanna et al., in 2008 have reported that intense interval training group showed improvement in the ability of heart to pump blood continuously through continuous moderate exercises.

The other study done by Esprlech et al., in 2010 showed the increase in Vo<sub>2</sub> max levels in intense interval training than the continuous moderate exercise.

A study done by Gybala et al., in 2006 on the effects of intense interval training program and continuous moderate exercise on physiological factors affected aerobic capacity despite showed that the smaller interval training program have reported adaptations such as increase in stroke volume, cardiac output due to increase in the flow of oxygenated blood through capillaries to the cardiac muscle and skeletal muscle. This further lead to improvement of Vo<sub>2</sub> max levels in the intense interval training group compared to the continuous trained group<sup>10</sup>.

In the present study the results shown in the table 2 concludes that intermittent training is more effective than continuous training. A similar study done by Dan baker et.al., in 2011 concluded that continuous aerobic training for 20 to 40 minutes or more doesn't show more effect as intense intermittent training showed in the field sports<sup>8</sup>.

## 6. Conclusion

The present study was done to find the effectiveness of continuous endurance training versus intermittent endurance training on aerobic capacity in recreational female hockey players. When comparing the pre and post values, the post values of the Vo<sub>2</sub> max were improved in both the groups. However, the improvement of Vo<sub>2</sub> max was significant in intermittent training group when compared to continuous training group.

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