

Effect of High intensity interval training versus Fartlek training on Speed and VO₂ max among collegiate basketball players

¹Dr. Manoj Abraham. M, PhD, ²Mrs. Saranya. Y, MPT, ³Mr. Hrishikesh. V. P

¹Principal, ²Vice Principal, ³BPT Intern

Department of Physiotherapy

K. G. College of Physiotherapy (Affiliated to the Tamil Nadu Dr. M. G. R. Medical University)
Coimbatore, Tamil Nadu, India

Abstract- Basketball players importantly require speed and good aerobic capacity (VO₂ max) to perform their skill to the fullest during their match time. Training methods can be adopted to increase their capacities and bring better results in the match outcome. The objective of the study is to find the effect of High Intensity Interval Training versus Fartlek Training on increasing Speed and VO₂ max among collegiate basketball players. This is a Pre-test and post-test experimental study design where 30 male Basketball players of KG Institutions were randomly divided into two groups, consisting of 15 players each group (Group A and Group B). The players were between age 18-24 and the training duration lasted for 6 weeks. The outcome measures used are 30 M Sprint run test and 1 Mile run test to assess prior and post speed and VO₂ max levels. Statistical analysis was done using Paired and unpaired 't' tests, which showed a significant improvement in group A concluding that, High Intensity Interval Training was proven to be more effective on improving the Speed and VO₂ max than Fartlek Training among Collegiate Basketball Players.

Index Terms- High intensity interval training, Fartlek training, Speed, VO₂max and Basketball players.

I. INTRODUCTION

The dynamic characteristics of basketball as a team sport have brought global popularity and attracted players and spectators all over the world. Basketball is a game in which shooting, passing and dribbling of the ball together with player positioning as well as offense and defense structures are essential. In this sport, players play 40 minutes with a variety of multidirectional movements, such as running, dribbling, and shuffling at variable velocities and jumps, covering about 4500 to 5000 meters [1]. All abilities should be trained in a particular way for the success of this sport. To develop an effective game, the modern basketball player must possess specific physical characteristics. It is a feature of this sport that, under pressure from one or more opponents and with little time to recover, such efforts are continuously repeated. Basketball is an intermittent sport that has a high level of intensity. This means that basketball includes both a fast player character and sometimes a slow. There is a very fast change of intensity in the game and some researchers have shown that players can perform more than 1000 changes of direction, which require aerobic ability and speed during play [2].

The speed of the player's movement helps to move in an optimal range of motion, deliberately and with deliberate intention, from one direction to another. And speed isn't just measured by how fast a person is, there are several components of measurements that give an overall picture of the player's velocity. Over the last few years, speed has become recognized by coaches and researchers in a variety of sports [3]. Although physical attributes in basketball are known to be different, the game position of the players is as important. A report has been made that a key sports specific movement that all players perform is change in direction and speed. Speed training is of fundamental importance. Basketball players' footwork and cardio skills are improved on having good respiratory stamina. In reducing the injury of basketball players, speed also plays a major role. Speed training helps to reduce fatigue, increase your output with more effort, maintain a higher pulse and mentally cope with the physical discomfort of running in basketball games. There is a strong relationship that required dynamic capacities of the basketball game notably increased with players with increased speed, and it shows the overall importance of speed in a basketball player [4].

A well-developed aerobic system is required to be effective at peak levels of exercise in long periods of training, enabling the delivery of oxygen into tissues through a sustained series of exercises. High-level Aerobic training, while slowing down the onset of fatigue, raises anaerobic threshold and improves clearance of lactates. Explosive energy is produced both from the upper and lower limbs by muscular strength and power. The maximal uptake of oxygen refers to the intensity of the aerobic process and is actually a measure of the player's ability to use it. At a certain point the maximum oxygen VO₂ max shall be taken into account. It is the most significant part of endurance performance. Such important abilities can be delivered in the form of a variety of training like High intensity interval training and Fartlek training.

High Intensity Interval Training (HIIT) is one of the most efficient exercises in improving physical abilities that origins of High Intensity Interval Training (HIIT) can be traced back to the early 1900s, when Olympic runner Paavo Nurmi and his coach Lauri Pihkala began using the interval training system for their training sessions [5]. This exercise model has received a lot of attention worldwide because of the tissue adaptations it produces, similar to the adaptations produced by other aerobic exercises where training sessions can be completed in 20 – 30 minutes timeframes, depending on the duration of each exercise.

Fartlek is a Swedish word which means "speed play". Fartlek training is simply defined as periods of fast running intermixed with periods of slower running. Fartlek is a form of road running or cross country running in which the runner, usually solo, varies the pace significantly during the run. It is an advanced training technique, for the experienced runner who has been using interval

training to develop speed and to raise the anaerobic threshold. This further confirms that the requirements for carrying out training with heart and lung fitness are a frequency of 3-5 times each week, the intensity of the exercise is at 75% -85% of the maximum heart rate which aims to increase the speed and aerobic capacity in games like basketball also [6].

II.METHOD

A two-group, randomized, Pre-test and Post-test experimental study design studied at K. G. Institutions, Saravanampatti, Coimbatore. A total of male 30 samples who are aged between 18-24, BMI 19-25 kg/m² and healthy collegiate level basketball players with at least 1 year practice are involved. Players with recent injuries, psychologically unstable and unwilling are excluded. Each group consists of 15 members, and they are named Group A and Group B and followed the protocols below.

The training sessions were held for 6 weeks once a day and 30 minutes per session (3 sessions per week). Prior to and post the training sessions, the players were assessed for speed and VO₂ max levels using the 30 M Sprint run test and 1 Mile run test [1], [4]. Group A and B underwent the following High Intensity Interval training (Table 1) of 30 minutes which can be included with warm up and down and Fartlek training given in Table 2 needs to repeat thrice for a total of 15 minutes.

Table 1 – HIIT Protocol [6]

Segments	Minute 1	Minute 2	Minute 3	Minute 4
Segment 1	High knee run	Plank Punch	Jumping Jacks	Side Skaters
Segment 2	Jump Rope	In/Out Boat	Line Jumps	Push-ups
Segment 3	Burpees	Russian twists	Squats	Lunges
Segment 4	Mt. Climbers	Push-Ups	Split Squats	Box Jump

Table 2 – Fartlek training protocol [7]

TYPES OF RUNNING	DURATION
Jog	60 seconds
Run Hard (3/4 pace)	90 seconds
Jog	45 seconds
Sprint and Jog	40 seconds
Run Backwards	30 seconds
Walk and Run Hard	90 seconds
Repeat thrice	15 minutes

III.RESULT

Table 3 – 30 M Sprint run tests' unpaired 't' test values of group A vs B

S. N	SPEED	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	't' VALUE
1.	GROUP – A	4.32	0.20	1.11	5.13
2.	GROUP – B	4.52			

Table 4 – 1 Mile run tests' unpaired 't' test values of group A vs B

S. N	VO ₂ MAX	MEAN	MEAN DIFFERENCE	STANDARD DEVIATION	't' VALUE
1.	GROUP – A	68.55	0.20	1.92	6.90
2.	GROUP – B	67.85			

The study was conducted to find the effect of High Intensity Interval Training versus Fartlek Training among collegiate basketball players. The Post-Test mean value of Speed duration in Group A (n=15) who underwent High Intensity Interval Training is 4.32 and Group B(n=15) who underwent Fartlek Training is 4.52. This confirms the significant improvement in the speed performance of High Intensity Interval Training (Group A) than Fartlek training (Group B). The Post-Test mean value of VO₂ max capacity in Group A who underwent High Intensity Interval Training is 68.55 and Group B who underwent Fartlek Training is 67.85. This confirms the significant improvement in VO₂ max capacity of the High Intensity Interval Training Group A than the Fartlek Training group B. The calculated Paired 't' values of Group A are 19.25 and 23.45. The calculated Paired 't' values of Group B are 7.18 and 18.81. The unpaired 't' values of post-test are given in Table 3 & 4 for the comparison of Group A&B.

IV.DISCUSSION

The purpose of the study is to find the effects of High Intensity Interval Training versus Fartlek training on speed and VO₂ max in collegiate basketball players. A clear explanation about the study is given to each and every subject on their own language and they were assigned randomly into two groups. A written consent form was taken from each player. 30 players of KG Institutions were selected out of the 45 interested players were randomly divided into two groups. The study was conducted in the K. G. Institutions where the Group A undergone High Intensity Interval Training and the Group B undergone Fartlek Training through a set of 30

minutes protocol for 6-weeks with 3 days per week with 1 session a day. The study was done with pre-test and post-test using and 30M sprint run test and 1 Mile Run test. The game of basketball is recreational and a competitive game. The normal VO₂ max for a male Basketball player ranges from 45-65 (ml/kg/min) and speed around 5-7 meter per second. High Intensity Interval Training improves the VO₂ max due to the High intensity intermittent training program effectively increases oxidative enzyme activity in muscle.

Due to High Intensity Interval Training recruits fast-twitch muscle fibres and helps in increasing the Sprinting speed too. These fibres are designed for short-lived, powerful bursts of energy. Fast-twitch fibres need more fuel than do slow twitch fibres to function and to recover from a workout. Also, High Intensity Interval Training increases the muscle strength by the application of resistance with own body weight. This happens especially due to the nature of the High intensity Floor exercises The Short-term (6 weeks) High-Intensity Interval Training, performed 3 times per week, leads to an increase in peak oxygen uptake [8].

On the other side, Fartlek training also helps in increasing the VO₂ max mostly by increasing endurance by activation of Slow twitch fibres and increase ATP synthesis through a long duration which is very important for being active throughout the match. Steady-state cardio recruits slow-twitch muscle fibres, which are structured for endurance and also speed has been increased comparatively, before the training [9]. 30 Meter Sprint run test for the comparison of the player's Sprint speed capacity is done pre and post training individually in the track under the supervision. 1 Mile run test helps in assessing the maximal VO₂ max capacity of the players where it is a contrast test from the previous one as it requires a running for a long duration and utilization of oxygen for a longer duration of time and the 1 Mile run test involves running a distance of 1.5 kilometres running 4 times in a 400 Meter track. The player runs in his maximal capacity and the required data is collected at the end of the test. Both High intensity interval training and Fartlek training helps increasing the Sprinting capacity and the VO₂ max capacity among the basketball players [10].

V. CONCLUSION

The results were analysed using student "t" test and the study concludes that both High Intensity Interval Training and Fartlek training produced significant improvement in Speed and VO₂ max in Group A and B that High Intensity Interval Training given to Group A was proven to be more effective on improving Speed and VO₂ max than Fartlek Training given to Group B. Hence, the study concludes that High Intensity Interval Training was proven to be more effective on improving the Speed and VO₂ max than Fartlek Training among Collegiate Basketball Players.

VI. LIMITATIONS

The study only focuses among collegiate sprinters. The study focuses on two training techniques only. Certain factors such as climatic conditions, Nutritional facts, psychological factors and Activities of daily living could not be controlled during the study. The duration of the training period was limited. Only Male collegiate sprinters were included in the study. The study was conducted on a smaller sample size.

VII. RECOMMENDATIONS

Study can be done with female players. Different training programs can be used for a prolonged or short period. Similar studies can be performed on other sports. Similar studies can be done at various duration of training. Samples with different BMI ranges can be categorized for future study. Study can be also implemented for the beginners and professionals. Further studies can be conducted using bigger sample size.

REFERENCES:

1. Avunoori Malleesh, Suresh TN, Sivakumar VPR, "Effectiveness of Sports Specific Circuit Training and High Intensity Interval Training on Aerobic Capacity in Male Basketball Players", *International Journal of Clinical Skills* (2017) 11(6), 177-184.
2. Balciunas, Stonkus, Abrantes, & Sampaio, "Long term effects of different training modalities on power, speed, skill and anaerobic capacity in young male basketball players", *J Sports Sci Med* (2006 Mar) 1;5(1):163-70.
3. Sameer Bashir, Bilal Ahmad Hajam, "The effect of fartlek training on speed and endurance of physical education students of Annamalai University", *International Journal of Academic Research and Development* (2017); Volume 2; Issue 5; Page No. 142-145.
4. Festiawan R, Hoi LB, et al., "High-intensity interval, fartlek training & Oregon circuit training: What are the best exercises to increase VO₂ max?", *Ann Trop Med & Public Health* (2021); 24(S03): SP24363.
5. Florian Azad Engel et al., "High-Intensity Interval Training Performed by Young Athletes: A Systematic Review and Meta-Analysis", *Front Physiol*. 2018; 9: 1012.
6. Francesca D'Elia et al., "Increase the Performance Level of Young Basketball Players through the Use of High Intensity Interval Training", *International Journal of Human Movement and Sports Sciences*, 2021, 9(3):445-450.
7. Bashir S., Hajam B. A. "The effect of fartlek training on speed and endurance of physical education students of Annamalai University". *International Journal of Academic Research and Development*, Volume 2, Issue 5, 2017, Pages 142-145.
8. Clark M, Lucett S, McGill E, Montel I and Sutton B (Editors). (2018). *NASM Essentials of Personal Fitness Training* (6th ed). Burlington, MA: Jones & Bartlett Publishing.
9. Ma X, Cao Z, Zhu Z, Chen X, Wen D, Cao Z. VO₂max (VO₂peak) in elite athletes under high-intensity interval training: A meta-analysis. *Heliyon*. 2023 Jun 1;9(6).
10. Das SK, Dutta A, "Relation of speed of a mile run, maximum energy cost of running, and maximum oxygen consumption: a field study", *Br J Sports Med*. 1995 Dec;29(4):271-2.