

# Effects of High Intensity Interval Training on Cardiovascular Endurance and Speed among under 16 Hockey Players

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**Abstract:** This study aims to see the effectiveness of High Intensity Interval Training (HIIT) and skill training on cardiovascular endurance and speed among Bukit Jalil Sports School under 16 hockey players. The sample consisted of 40 male players aged 14 to 16 years old. This study was a quantitative research by using quasi experimental method. The respondents were divided into two groups, treatment group (HIIT training) and control group (skill training). The training program was conducted for eight weeks. "Bleep Test" (BT) and "30meter Speed Test" (30ST) were used during pre-test and post-test to see the effectiveness of the training in enhancing physical fitness capabilities. The paired sample t-test analysis between pre and post tests showed significant differences after performing HIIT training in cardiovascular endurance ( $t = (19) = -5.448, p = 0.000, (p < 0.05)$  in speed ( $t = (19) = 3.313, p = 0.004, (p < 0.05)$ ). While the independent t-test of post-test after the intervention program showed no significant differences in the score among HIIT training and skill training on cardiovascular endurance ( $t = (38) = 1.431, p = 0.161, (p > 0.05)$ ) but showed significant differences on speed ( $t = (38) = -3.303, p = 0.002, (p < 0.05)$ ). The findings of this study clearly showed that HIIT workouts have a positive effect on speed compared to skill training among under 16 years old hockey players in Bukit Jalil Sports School. There was no significant difference between the two groups in cardiovascular endurance. This means that the skill training also enhances cardiovascular endurance. Further research needs to identify a better and holistic intervention program to enhance not only the hockey players' fitness level but the other sports players too.

## 1 INTRODUCTION

In Malaysia, field hockey is considered a popular sport with many followers and the high standard of Malaysian Hockey League attracts many foreign players to participate in this competition. In 1975, Malaysia achieved its highest level as the fourth best team in the World Cup which was held in Kuala Lumpur. This achievement made the game popular among school going children and also adults. Field hockey gained more support from the government in the form of funding which aims to promote this game at grass root level. Today Malaysia's men team is ranked twelve in the world. This is due to the hard work undertaken at the grass root level and continued development programs with the juniors and further development and enhancement at the senior level. This continued long term development program has made the men Malaysian team where it is today.

Malaysian Hockey Confederation (MHC) has a mission to break into the top ten ranking which requires new training methodology and ideas to which will benefit and improve the performance of the team in the future. Malaysia's men hockey team qualified for the Men World Cup 2018 on December in India. MHC has prioritized its mission to qualify for the 2020 Olympic in Japan.

Expert performance identification between elite and sub-elite players is mainly focused during the time of transition in the adolescence life. Analysis done on field hockey shows clearly that field hockey is a high intensity non-continuous game which has high physiological demands. The players' action involves explosive movements such as intermittent sprinting together with many changes of direction, cruising and dribbling the ball which can be categorized as heavy load. If the players wish to play at the highest level, they will need to improve and develop their endurance capacity. By this, it means

the players are able to perform high intensity activities such as running and sprinting and still has the ability to recover in time for the next action (Jakeman, John, Judith McMullan, and John Babraj, 2016).

Hockey involves mainly intermittent high intensity pattern of activity, demanding high aerobic and anaerobic fitness which mainly involve frequent short sprints, change of directions and accelerations-decelerations that are very common in addition to walking and jogging in order to cover large area of the playing field (Barun Hanjabam, Jyotsna Kailashiya, 2014). Field hockey is also known as an invasive territorial and long duration playing game that involves considerable aerobic energy contribution superimposed with brief though frequent anaerobic efforts (Gayatri, Pandey; Saon, Sanyal; Gireesh, Pandey, 2016). The field hockey players need to excel in the four pillars of training which are physiological, technical, tactical and psychological to achieve the high standard in the game.

The match analysis done by Barun Hanjabam and Jyotsna Kailashiya (2014), on field hockey games clearly showed that field hockey is a high intensity game with a high demand on physiology aspects. The physiological demand involves aerobic and anaerobic capacity, strength, agility, speed and flexibility. In field hockey, it is important that intermittent running such as acceleration and deceleration and the ability to do many changes of direction while sprinting is so specific.

According to Jakeman, McMullan & Babraj (2016), high intensity interval training (HIIT) is the leading training method currently used by team sports to improve the Vo<sub>2</sub>max uptake which will enhance the athletes' performance during matches. HIITs are a common trend of training method used by teams because of its time efficiency and popularity with young children who are bored with traditional methods such as long runs. HIITs are among the most widely used technique particularly in team sports because of the demand of the sports which requires continuous intermittent running in sports such as football and field hockey. HIIT is widely considered as an exercise which involved speed, agility, strength, explosive power and the ability to repeat super maximal running bouts and able to maintain it continuously during the matches. HIIT is an important part of the training which helps to develop maximal oxygen uptake (Vo<sub>2</sub>max) and enable the players to repeat the running bouts required by the sports during matches.

HIIT is increasingly becoming popular not only with team sports but also with people wanting to reduce their weight and has been prescribed to diabetic patients as a form of exercise which would help maintain the sugar level. HIITs are generating considerable interest in terms of followers and usage because of its time saving methods and the type of exercises used in the program. More teams are using HIITs because it produces quick results compared to long steady continuous runs. HIITs are attracting widespread masses due to information gathered about the relationship between Vo<sub>2</sub>max and repeated sprint ability which has shown the effects of it on the recovery process and this has influenced the game performance and the distance covered during the games (Harrison, Gill, Kinugasa, Kilding, 2015).

HIIT not only improve the Vo<sub>2</sub>max capacity but helps people with weight problem and inactive individuals by helping to reduce the fat levels. HIITs are considered fun and enjoyable activity which will help develop a self- interest involvement which could become a routine in their future (Roy, Brad, 2013). HIIT is responsible for technical and tactical ability of the players to perform well during matches according to the requirements and demands of the sport. Exercise places an increased demand on the cardiovascular system. Oxygen demand by the muscles increases sharply. Metabolic processes speed up and more waste is created. More nutrients are used and body temperature rises. To perform as efficiently as possible, the cardiovascular system must regulate these changes and meet the body's increasing demands. High Intensity Interval Training is a method of training which involves repeated bouts of high intensities efforts that range from 5 seconds to 8 minutes followed by recovery periods of varying lengths of time (Konopka & Harber, 2014).

Like any other team sports, field hockey players' movements are typically characterized by short bursts of very high-intensity activities combined with low-intensity activities for recovery and periods of inactivity both on the pitch and during substitutions (White & MacFarlane, 2013). Although male field hockey players spend most of a match playing at low intensity such standing, walking, and jogging the production of repeated actions at high or sprint intensity is crucial for success in this sport (Lythe & Kilding, 2011). The breadth of current research has revealed that HIIT improves numerous physiological parameters, often in less time when measured against high volume continuous exercise (Daussin et al., 2008).

Anaerobic capacity is very much required by the players in order to do many burst sprinting forward and to chase back to repossess the ball. Aerobic capacity plays a very important role in providing efficient recovery during the short rest periods (Barun Hanjabam and Kailashiya, 2017). In order to identify the precise area of fitness and conditioning to team sports performance, specific test should be conducted instead of a widely holistic overview of conditioning. Most of the reported studies are only focusing on adult or elite athlete. There are very few researches being done for the young or development age team sports.

HIITs' are more appealing to youth compared to the traditionally long activities. By getting the youth to involve in HIITs', which they consider fun and enjoyable, will continue to develop a self-directed physical activity which could follow to their adulthood. The ability to successfully performance repeated high intensity intermittent bouts are important in invasion team sports which last from 60 – 120 minutes. An athlete level of fitness determines how well the athlete recovers during recovery to delay the onset of fatigue whereby allowing the high intensity exercise to be sustained during game (Greig, Logan, Harris, Duncan and Schofield, 2014).

The achievement of Bukit Jalil Sports School hockey team at the national level tournament is still at a mediocre despite having achieved previous glories. Among the factors that could have caused this problem is the weakness in physical fitness preparations. Therefore, more emphasis needs to be given from the physical conditioning aspect of the athlete. This is because apart from the aspect of skill training in the technical and tactical aspects of the game, importance of physical fitness should also be considered as part of the important elements of the sports.

Fitness enhancement training programs through systematic conditioning training should be conducted constantly so that their fitness level is always at an optimal level. Through this study, researchers found that to enhance the fitness level in terms of cardiovascular endurance and speed, the players need a well organised form of training using the HIIT training program. HIIT is an effective exercise to drill as it can improve aerobic and anaerobic capacity. However, the exercise does not give specific information regarding the optimum distance or time needed for the exercise. We need to know which type of HIIT exercise will benefit young team sports players. HIIT is also expected to improve weight management among young team sports players.

The purpose of this study was to improve the endurance level of the players' towards the components that have been identified; it is aimed to ensure the players' success in the Malaysian Junior Hockey League 2019 and other competitions. The researchers used HIIT training program to study the effectiveness after eight weeks on VO<sub>2</sub>max and speed. This research will provide valuable information for athletes, coaches, Bukit Jalil Sports School and other organizations about the advantages and disadvantages of HIIT training programs provided to improve the young hockey players' performance.

## 2 METHODOLOGY

This quasi experimental study was conducted among 40 hockey players from Bukit Jalil Sports School. All the respondents are 14 to 16 years old. The sample were divided to two groups randomly, whereby the treatment group (n=20) performed the HIIT program while the control group (N=20) performed normal skills training. The treatment group was systematically following a prepared training program while the control group will follow the regular training or skill based training. This training program by the treatment group was conducted two times a week over the span of eight weeks.

In this study, researchers used HIIT program that was expected to enhance the players' cardiovascular endurance and speed. An overview of the respondents to this activity was given in this study. The treatment group respondents were given a HIIT program consisted of 400 meters run with four repetitions done in three sets. The respondents were given rest ratio 1:1 time between each repetition. The respondents were also given a rest of six minutes between each set as rest interval. A total distance of 1600 meters was covered for each set. The respondents covered a total distance of 4800 meters for completion of the three sets. Multi Stage Shuttle Run (Bleep) test was used to monitor the development of the athlete's maximum oxygen uptake (VO<sub>2</sub> max) and speed was tested using 30m Speed Test. The collected data were analysed using Paired Sample T-Test and Independent Samples T-Test.

### 3 RESULTS

The pair sample t-test result between pre and post-test clearly showed that both groups had an increased VO<sub>2</sub>max uptake for cardiovascular endurance. The descriptive analysis for the treatment group using the HIIT training program provides a higher increase in VO<sub>2</sub>max compared to the control group that performs regular skill training. Results from the independent t-test of post-test after the intervention program showed no significant differences in the score among HIIT training and skill training on cardiovascular endurance ( $t = (38) = 1.431$ ,  $p = 0.161$ , ( $p > 0.05$ ). The analysis for speed showed significant differences on speed ( $t = (38) = -3.303$ ,  $p = 0.002$ , ( $p < 0.05$ ). The findings of this study proved that HIIT workouts have a positive effect on speed compared to skill training among under 16 years old hockey players in Bukit Jalil Sports School.

### 4 CONCLUSION

Based on the findings, it can be concluded that there was a significant difference between the HIIT group and the skill group after intervention program. HIIT training group have a better impact on cardiovascular endurance and speed than skills training group. This research, proved that using this systematic HIIT workout method by trainers can develop the best performance in terms of speed and cardiovascular endurance among Bukit Jalil Sports School hockey players. Alexandra Hannah Roberts (2016), also says the use of more systematic training by coaches can have a positive impact on the fitness level of sports players. The findings of this research also supported by Charan Singh (2015) and Cunanan, DeWeese, Wagle (2018). The research done by both groups emphasize that systematic training using HIIT will enhance the muscles adaptation towards the intensity given through the intervention program. Speed can be improved in short-term training if the athlete is ready to undergo the training without injury.

It is hoped that this study will be a guideline for all coaches, especially in helping to choose the most appropriate training to enhance the fitness level of hockey players. To assist other researchers making this method of research for the future, it is important that the selected respondents are really all set to carry out a specified intervention program and test. The readiness of players or athletes is significant in

attaining any training program. In addition, researchers should give priority to the safety and comfort of the respondents in order to perform well throughout the intervention program (Gharbi et al 2015). This research also indicates that not only specifically applicable to hockey players but also to other sports players and athletics where they can improve their cardiovascular endurance and speed using this intervention program by considering all the training principals such as frequency, intensity, time and individual differences.

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