

EFFECT OF TABATA INTERVAL TRAINING ON VO₂MAX OF SCHOOL BOYS

A.Antony Soundrarajan*, C.Sugumar**

*Physical Director, A.P.C. Veerabahu Matric.Hr.Sec.School, Tuticorin

**Head, Physical Education & Yoga Centre, Gandhigram Rural Institute - Deemed University, Gandhigram, Dindigul

ABSTRACT

The purpose of the study was to find out the effect of tabata interval training on VO_{2max} among school boys. In this study 30 male students were randomly selected from A.P.C. Veerabahu Matric.Hr.Sec.School, Tuticorin and divided into two groups as one experimental group and one control group. VO_{2max} were tested by using beep test from each subject before the training period, after the fourth, fifth and sixth week of training. The collected data were statistically analysed by using 2 X 4 factorial experiment [group TITG and CG] X test (pre, after the 4th week, 5th week and 6th week)] with repeated measures on the last factor was used on VO_{2max}. It was found that there was a significant improvement on VO_{2max} due to the influence of tabata interval training among school boys.

Key Words: Tabata interval training, High intensity interval training and VO_{2max}.

INTRODUCTION

Quinn (2016) explained the VO_{2max}, or maximal oxygen uptake, it is one factor that can determine an athlete's capacity to perform sustained exercise and is linked to aerobic endurance. VO_{2max} refers to the maximum amount of oxygen that an individual can utilize during intense or maximal exercise. It is measured as "milliliters of oxygen used in one minute per kilogram of body weight." This measurement is generally considered the best indicator of an athlete's cardiovascular fitness and aerobic endurance. Theoretically, the more oxygen one can use during high-level exercise, the more ATP (energy) one can produce. This is often the case with elite endurance athletes who typically have very high VO_{2max} values. Many sports such as football, basketball and cycling require energy from both the anaerobic and aerobic systems. Of course, in elite athletes VO_{2max} is not a good predictor of performance. While a high VO_{2max} may be a prerequisite for performance in endurance events at the highest level, other markers such as anaerobic threshold are more predictive of performance (Willmore & Costill, 2005). Most elite athletes will have VO₂ max values well over 60ml/kg/min, this number alone is not a guarantee of elite performance. A high VO₂ max may indicate an

athlete's potential for excellent aerobic endurance, but many other factors can determine the winner of a particular race (Quinn, 2016).

With many of us struggling to get enough exercise, sport and exercise scientists at Liverpool John Moores University (LJMU) and the University of Birmingham, under the lead of Professor Anton Wagenmakers, have been working on a time-saving solution. Instead of long stints in the gym and miles of running in the cold, the same results could be achieved in less than a third of the time, according to new research published in 1 February in *The Journal of Physiology*. The current recommendation of the World Health Organisation (WHO) and UK Department of Health is that people of all ages should do three to five hours of endurance training per week to increase health and fitness and prevent chronic diseases and premature mortality. However, most people find it difficult to set aside this much time in their busy lives (<http://www.physoc.org/press-release/2013/fitness-gains-fraction-time>). Interval training is based on a very simple concept: go fast then go slow. For those who are always using the excuse that there is not enough time to exercise, there is a new solution – **Tabata Training**. Tabata interval training is the single most effective type of high intensity interval training, it's also the most intense by far, and surprisingly it's the shortest in duration, it only last for four minutes... but those four minutes produce remarkable effects. Lose Fat, Get Fit in four minutes (<http://www.intervaltraining.net/tabata.html>).

Research shows that although VO₂ max has a genetic component and it can also be increased through training. The two methods for increasing VO₂ max include increases in both training volume and intensity. Research also indicates that the less fit an individual is, the more they can increase their VO₂ max through training. In fact, novice exercisers have been able to increase VO₂ max by 20 percent through proper training. Fit athletes have a harder time increasing their VO₂ max, most likely because they are already so near their genetic potential (Quinn, 2016). Based on the above information, researcher made an effort to observe the effect of tabata interval training with 20seconds active: 10seconds rest period on VO_{2max} among school boys.

OBJECTIVES

The following are the specific objectives of this study.

1. To find out the effect of tabata interval training with 20 seconds active period : 10 seconds rest period on $VO_{2\max}$.
2. To find out the appropriate training duration needs to increase the $VO_{2\max}$ level among school boys.

METHODOLOGY

To achieve the purpose of this study, 30 male school students were selected from A.P.C. Veerabahu Matric. Hr.Sec. School, Tuticorin, Tamilnadu, India, at random and their age ranged from 14 to 15 years. The selected subjects were divided into one experimental group and a control group with 15 subjects (n=15) each. Group I (TITG) underwent tabata interval training with 20seconds active period: 10seconds rest period. The training period was six

weeks with three sessions per week. Group II (CG) served as control group. However, control group was not exposed to any specific training but they participated in the regular scheduled work. Selected subject's $VO_{2\max}$ were tested three days before, one day after the 4th week, 5th week and two days after the training period (6th week) by conducting beep test.

ANALYSIS OF DATA

The data pertaining to the variables in this study were examined by using 2 X 4 factorial experiment factorial experiment [group TIG and CG) X test (pre, after the 4th week, 5th week and 6th week)] with repeated measures on the last factor was used on $VO_{2\max}$. Whenever the 'F' ratio for interaction was found to be significant, simple effect test was used as a post-hoc test to determine which of the group was significant and whenever the 'F' ratio for interaction was found to be significant in the simple effect test, Scheffe's test was used as a post-hoc test to determine which of the paired means were significant. In all the cases 0.05 level was fixed as the significant level.

TABLE I Summary of Descriptive Statistics on $VO_{2\max}$ of TITG and Control Groups

Groups	Tests	Mean	SD	Min	Max
TITG	Pre	33.57	0.03	33.53	33.62
	4 th week	33.69	0.04	33.62	33.81
	5 th week	33.71	0.05	33.65	33.86
	6 th week	33.73	0.06	33.66	33.89
CG	Pre	33.56	0.03	33.53	33.61
	4 th week	33.58	0.04	33.53	33.64
	5 th week	33.57	0.03	33.53	33.63
	6 th week	33.58	0.03	33.54	33.64
Tabata Group		33.67	0.08	33.53	33.89
Control Group		33.67	0.08	33.53	33.89

TABLE II Summary of Analysis of Variance for 4 X 2 Factorial Experiment with Repeated Measures on the Last Factor on $VO_{2\max}$

Source	SS	df	MS	F
Between Ss	0.453067	29	0.015623	60.72269*
A (Group)	0.310083	1	0.310083	
Ss w. groups				
(Err. Between)	0.142983	28	0.005107	
Within Ss	0.272	90	0.003022	
B (Tests)	0.133053	3	0.044351	80.3312*
AB (Groups X Tests)	0.09257	3	0.030857	55.88931*
BxSs w. groups				
Error Within	0.046377	84	0.000552	
Total	0.725067	119		

* Significant at 0.05 level.

Table value required for 0.05 level of significance with df (2,28, 1,84 & 3,84) are 4.2, 3.96 and 2.72 respectively.

TABLE III Simple Effect Post-Hoc Test For Groups X Tests Interaction on VO₂MAX

Source	SS	df	MS	F
Group for Pre test	0.000403	1	0.000403	0.73054
Group for 4 th week	0.102083	1	0.102083	184.899*
Group for 5 th week	0.137363	1	0.137363	248.8001*
Group for 6 th week	0.162803	1	0.162803	294.8785*
Tests for TITG	0.223165	3	0.074388	134.7363*
Tests for CG	0.002458	3	0.000819	1.484223
Error Within	0.046377	84	0.000552	

Table value required for 0.05 level of significance with df (1,84 & 3,84) are 3.96 and 2.72 respectively.

TABLE IV Scheffe's Test for the Differences Between the Paired Means of Tests and Irrespective of Groups on VO₂MAX

Pre	4 th week	5 th week	6 th week	MD	CI
33.567	33.635			0.068*	0.21
33.567		33.63767		0.070667*	0.21
33.567			33.65367	0.086667*	0.21
	33.635	33.63767		0.002667	0.21
	33.635		33.65367	0.018667	0.21
		33.63767	33.65367	0.016	0.21

* Significant at 0.05 level.

TABLE V Scheffe's Test for The Differences Between the Paired Means of Tabata Interval Training Group X Tests On VO₂max

Pre vs 4 th week	Pre vs 5 th week	Pre vs 6 th week	4 th week vs 5 th week	4 th week vs 6 th week	5 th week vs 6 th week	CI
0.123*	0.135*	0.157*	0.012	0.034*	0.022	0.025

* Significant at 0.05 level.

RESULTS AND DISCUSSION

The results of the study indicates that significant difference exist between the experimental and control groups on VO₂max. Besides, significant difference exist among school boys. At the same time that was there were no significant difference found between the 4th and 5th week and between the 5th and 6th week on VO₂max.

The results of the study confirmed by the following experts' ways: Regular physical activity is protective and helps to maintain a healthy body composition (Hansen, et al., 2007). The findings of the present investigation is also supported with the findings of Tabata, et al., (1997) who suggested that intermittent exercise defined by the Intermittent Exercise protocol (20s exercise with a rest 10s) may tax both the anaerobic and aerobic energy releasing systems almost maximally. Billat, et al., (2001) suggested that short interval-training of 15s-15s at 90-80 and 100-70% v VO₂ max proved to be the most efficient in stimulating the oxygen consumption to its

highest level in healthy middle-aged long-distance runners used to doing only long slow distance-training. The findings of the present investigation is also supported with the findings of Helgerud, et al., (2007); Rozenek, et al., (2007). Tabata et al., (1996) concluded that after HIIT training period, VO₂max increased by 7 ml/Kg/min. The present study also revealed that after 6 weeks of tabata interval methods of various durations increased VO₂max significantly. The result of present investigation also supported by the researchers Natasha Carr (2011); Helgerud, et al., (2006); MacDougall, et al., (1998); Wakefield and Glaister (2009); Tabata, et al., (1995); Astorino, et al., (2012); Dunham and Harms (2012) and Fernandez-Fernandez, et al., (2012).

CONCLUSIONS

The current study highlights on tabata interval training on VO₂max among school boys. The present study exposed that tabata interval (20:10 seconds, Work: rest ratio) training had increase the VO₂max level. Due to the influence of four weeks of tabata

interval training enhance the VO_{2max} level and it continues to increase after the 5th week and 6th week of training period.

REFERENCES

- [1] Astorino, T.A., Allen, R.P., Roberson, D.W., Jurancich, M., (2012), "Effect of High-Intensity Interval Training on Cardiovascular Function, VO_{2max} , and Muscular force", *Journal of Strength and Conditioning Research*, 26(1), PP.138-45.
- [2] Carr, Natasha, (2011), "The Effect of High Intensity Interval Training on VO_2 Peak and Performance in Trained High School Rowers", *Unpublished Degree Master of Science*, Arizona State University, May 2011.
- [3] Dunham, C. and Harms, C.A., (2012), "Effects of High-Intensity Interval Training On Pulmonary Function", *European Journal of Applied Physiology*, 112(8), PP.3061-8.
- [4] Fernandez-Fernandez, J., Zimek, R., Wiewelhove, T. and Ferrauti, A., (2012), "High-Intensity Interval Training vs. Repeated-Sprint Training in Tennis", *Journal of Strength and Conditioning Research*, 26(1), PP.53–62.
- [5] Helgerud, J., Høydal, K. L., Wang, E., Karlsen, T., Berg, P. R., Bjerkaas, M., Simonsen, T., Helgesen, C. S., Hjorth, N. L., Bach, R., and Hoff, J., (2006), "Differential Response to Aerobic Endurance Training at Different Intensities", *Medicine and Science in Sports and Exercise*, 38(5), Supplement Abstract 2581.
- [6] Helgerud, J., Høydal, K., Wang, E., Karlsen, T., Berg, P. R., and Palr., (2007), "Aerobic High Intensity Intervals Improve VO_{2max} More than Moderate Training". *Medicine and Science in Sports and Exercise*, 39(4), PP.665-671.
- [7] MacDougall, J.D., Hicks, A.L., MacDonald, J.R., McKelvie, R.S., Green, H.J. and Smith, K.M., (1998), "Muscle Performance and Enzymatic Adaptations to Sprint Interval Training", *Journal of Applied Physiology*, 84, PP.2138-2142.
- [8] Quinn, E., (Oct, 2016), What is VO_2 Max in Athletic Training?, <https://www.verywell.com/what-is-vo2-max-3120097>.
- [9] Tabata, I., Nishimura, K., Kouzaki, M., Hirai, Y., Ogita, F., Miyachi, M. and Yamamoto K., (1996), "Effects of Moderate-Intensity Endurance and High-Intensity Intermittent Training on Anaerobic Capacity and VO_{2max} ", *Medical Science and Sports Exercise*, 28(10), PP.1327-30.
- [10] Wakefield, B.R. and Glaister, M., (2009), "Influence of Work-Interval Intensity and Duration on Time Spent at a High Percentage of VO_{2max} During Intermittent Supramaximal Exercise", *Journal of Strength and Conditioning Research*, 23(9), PP.2548-54.