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## Effect of Tabata training on body composition and aerobic capacity of swimmers

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### Abstract

The purpose of the study was to find the Effect of Tabata training on Body composition and Aerobic capacity of swimmers. Thirty two swimmers, between the age group of 13-18 years from SAI Scheme in Kariavattom, Thiruvananthapuram, were selected as the subjects for the study. The variables selected were Body fat percentage, Lean body mass and VO2 Max. The group of thirty two swimmers were randomly divided into an experimental and control Group of 16 each. All the subjects were tested in the selected variables prior to and after 6 weeks of training period. The experimental group underwent tabata training for a period of 6 weeks while the control group did not involve in HIIT work out. t test revealed significant differences from pre-test to that of the post-test mean score in body fat percentage, lean body mass and vo2 max. The mean score of Experimental Group for pretest and posttest for body fat percentage was 22.19% and 19.70% Gain 11.22% and t value 6.602; Lean Body Mass 47.94 and 50.58% Gain 5.50% and t value 6.088; VO2 MAX 47.67 and 52.68% Gain 10.50% and t value 8.618 while that of control group was body fat percentage was 22.39 and 22.45% Gain 0.26% and t value 0.913; Lean Body Mass 46.67 and 46.62% Gain 0.13% and t value 0.922; VO2 MAX 49.30 and 49.28% Gain 0.03% t value 2.236. The findings of this study revealed that six weeks of tabata training resulted in an improvement in body fat percentage, lean body mass and vo2max in swimmers.

**Keywords:** Tabata training, HIIT, body composition, aerobic capacity

### Introduction

High intensity interval training (HIIT) is a form of exercise training that aims to work the body, at close to maximum capacity, repeatedly, for short bursts of time ranging from 8 seconds to several minutes, interspersed with periods of rest or active recovery Gibala & McGee (2008) [5]. The primary goal is to repeatedly pressurize the physiological systems beyond the level required in actual performance. According to researchers at Speedo, swimming for 30 minutes is as effective in terms of cardiovascular output, muscular development and calorie burn as an hour's land-based workout. HIIT swimming prescribes a different kind of workout in the pool and also in the field. Sperlich *et al.* (2010) [3]. Elite swimmers have looked outside the pool for training method which may offer additional benefits to performance beyond those which can be gained from swimming alone. The aims of competitive swimming is to cover a set distance within the constraints of a given stroke. In order to achieve this, a swimmer must reach, and maintain, the highest average velocity in comparison to his or her competitors. This requires a combination of attributes including technical proficiency, fitness, tactical awareness and strength. Gomez-Bruton *et al.* (2018). Tabata training is the form of "high intensity interval training" designed to get the heart rate up in that very hard anaerobic zone for short period of time. Tabata training known as Tabata protocol was discovered by Japanese Scientist Dr. Izumi Tabata. Although there are many different ways to perform HIIT, all of the programs are characterized by periods of all-out effort combined with periods of complete rest or low to moderate recovery periods Gibala & McGee (2008) [5].

The training duration is 4 minutes, with variety of exercises developing the different aspects of fitness, like strength endurance, aerobic and anaerobic capacity, avoiding the monotony in Training. The exercises are performed with Tabata music. Each exercise is performed for 20 seconds. There is 10 seconds rest in between each exercises and 1 minute rest between sets. Understanding how the impact of Tabata training would be on the aerobic capacity and body composition of swimmers was the purpose of this research.

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## Methodology

This study applied an experiment design based on the random allocation of swimmers to two groups: an experimental group (GE) which would undergo tabata training. to determine the effects of training protocol the variables were VO<sub>2</sub> Max/aerobic capacity using 20m multistage fitness test (MSFT) and Body composition was assessed through skinfold measurement using 'Durnin and Womersley' formulae. Thirty two male swimmers, between the age group of 13-18 years from SAI-LNCPE Scheme Kariavattom, Thiruvananthapuram, were selected as the subjects for the study. They had a minimum of 5 years of swimming experience, and specializing in various swimming style such as, free style, breast stroke, butterfly stroke, and back stroke. Most of them had national participation at school level. None of them had done tabata training before. The requirement for selection was to follow the whole protocol. Swimmers who had a previous injury, or was on rest for two weeks in the past two months were excluded from training. Participants were informed regarding the objective and purpose of the study. Participants gave informed consent and participation was voluntary. The programme lasted for 6 weeks, with three non-consecutive training sessions a week conducted before the usual training sessions. The GE had 18 sessions of tabata training. The GC replaced tabata with usual swimming warm-up sessions. In order to isolate tabata training impact as much as possible, both groups had the main swimming training sessions together at the same time. The players underwent a pre-test and post-test before and after the 6-

week training. For each test, measures were taken in two days. VO<sub>2</sub> Max/aerobic capacity using 20m multistage fitness test (MSFT) and Body composition was assessed through skinfold measurement using 'Durnin and Womersley' formulae.

The training program included warm-up session with stretching and rotational exercise, muscle- strengthening exercise and cool down session with stretching and losing exercise.

## Warm-up

The session began with total body stretch with both hand stretched upwards, followed by calf stretch, ham string stretch, gluteus stretch, exercise for the neck-lateral tilt of the neck, side ward movement of neck, neck rotation, shoulder shrugs, shoulder rotation, trunk forward, lunges, ankle rotation, wrist rotation. After the stretching they were involved in slow jogging for 5 minutes. Warm-up session lasted for 10-15 minutes, after warm up the subject were asked to do certain exercises.

## Tabata training

It is a HIIT workout for the duration of 4 minutes, with 8 varieties of exercises. The exercises are performed with Tabata music. Each exercise was performed for 20 seconds. There was 10 seconds of rest in between each exercises and 1 minute rest in between each sets. The swimmers had to undergo six weeks of Tabata training. The exercises ranged from simple to complex. Weekly schedule of Tabata training is presented in Table 1.

**Table 1:** Training programme

Week	Exercises	Duration	Set	Rest
1 <sup>st</sup> week Monday Wednesday Friday	Exercises High knees plank to Push up Burpees Jumping jacks Push up to inside kick Cross sit ups Side leg split (crouch position) Bicycle crunches	4x2=8 8 minutes	2 set	10 S (in between exercise) 1 M (in between set)
2 <sup>nd</sup> week Monday Wednesday Friday	Exercises Jumping to toe touches Half burpees (leg back) Legs up and down in 45 degree Prone position to side plank Jump to forward launching Plank to push up Squat jump Burpees	4x2=8 8 minutes	2 set	10 S (in between exercise) 50 Sec (in between set)
3 <sup>rd</sup> week Monday Wednesday Friday	Exercises Jumping jacks to clap Cross leg in 45 degree Push up with inside kick Sit up with heel touch Jump to forward launching Power plank Lying down to hold knees High knees	4x3=12 12 minutes	3 set	10 S (in between exercise) 40 Sec (in between set)
4 <sup>th</sup> week Monday Wednesday Friday	Exercises High knees to Cross heel touch Bicycle crunches Jumping jacks Russian twist Squat jump Push up Leg back touch to forward split Jumping to Clap under thigh	4x3=12 12 minutes	3 set	10 S (in between exercise) 40 Sec (in between set)
5 <sup>th</sup> week	Exercises High knees	4x4=16 16 minutes	4 set	10 S (in between exercise)

Monday	Cross sit up			30 Sec (in between set)
Wednesday	Push up to outside kick			
Friday	Raised leg (60 degree)to toes touch			
	Jumping to toe touches			
	Half burpees			
	Jumping jacks			
	Burpees			
6 <sup>th</sup> week	Exercises			
Monday	High knees			
Wednesday	Lying down to hold knees			
Friday	Jumping jacks	4x4=16	4 set	10 S (in between exercise)
	Push up to plank	16 minutes		30 Sec (in between set)
	Sit ups			
	Push up to inside kick			
	Russian twist			
	Burpees			

**Cool down**

Cool down session was regularly done following the workout session with an objective to get the body to near rest state. The session included stretching for major group of muscles in involved in training such as lower calf stretch, upper calf stretch, quadriceps stretch, gluteus stretch, chest stretch, lateral stretch, ankle pull, hamstring stretch, groin and inner thigh stretch, relaxation exercises and deep breathing exercises.

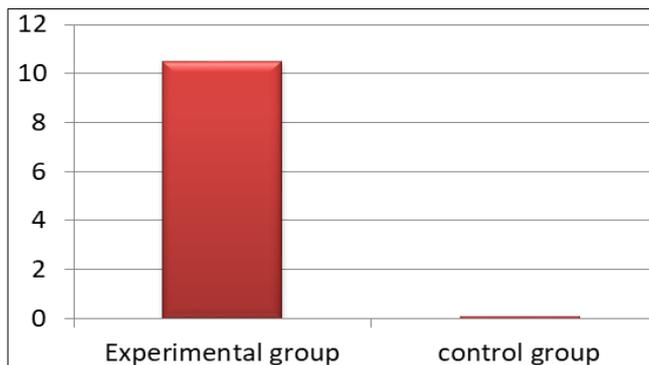
**Results**

Means, standard deviations, percentage gain and t values for all variables are provided for the experimental and control group in Tables 2-4, respectively. Percentage gain is presented in figures 1-3.

**Table 2:** Pre to post mean difference of VO2 max (ml/min/kg) for the experimental and control group

Experimental group					
PRE	POST	MD	% Gain	t	P-value
47.67	52.68	5.01	10.50	8.618	0.000**
Control group					
PRE	POST	MD	% Gain	t	P-value
49.30	49.28	0.02	0.03	2.236	0.041

Not significant at 5% level (P>0.05), \*\* Significant at 0.01 level (P<0.01).

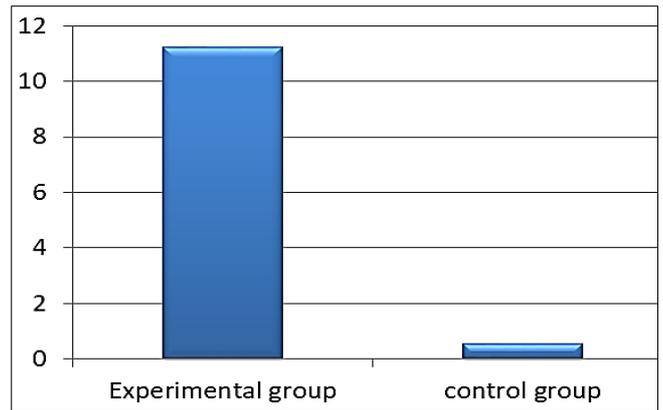


**Fig 1:** The percentage gain of VO2 max (ml/min/kg) scores in experimental and control group

**Table 3:** Pre to post mean difference of body fat percentage for the experimental and control group

Experimental group					
PRE	POST	MD	% Gain	t	P-value
22.19	19.70	2.49	-11.22	6.602	0.000**
Control group					
PRE	POST	MD	% Gain	t	P-value
22.39	22.45	0.06	0.26	0.913	0.376

Not significant at 5% level (P>0.05), \*\* Significant at 0.01 level (P< 0.01)

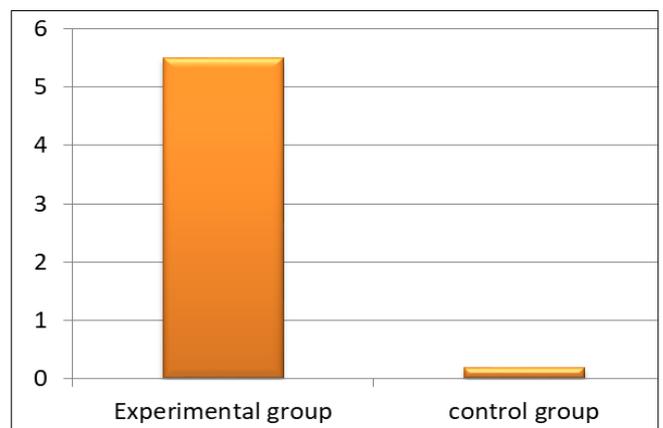


**Fig 2:** The percentage gain of body fat percentage for the experimental and control group

**Table 4:** Pre to post mean difference of lean body weight (kg) for the experimental and control group

Experimental group					
PRE	POST	MD	% Gain	t	P-value
47.94	50.58	2.64	5.50	6.088	0.000**
Control group					
PRE	POST	MD	% Gain	t	P-value
46.67	46.62	0.05	0.13	0.922	0.371

Not significant at 5% level (P>0.05), \*\* Significant at 0.01 level (P<0.01).



**Fig 3:** The percentage gain of lean body weight (kg) for the experimental and control group

Following the intervention the Experimental Group showed significant improvement in body composition, specifically in swimmers % fat, with a significant reduction by 11.22%. Furthermore VO2 max increased by 10.50% and lean body weight by 5.50%.

## Discussion

The analysis of the results revealed significant improvement in selected variables such as Body fat percentage, Lean body mass and VO<sub>2</sub> Max, following Six weeks of Tabata training. In the case of control group, no improvements were noticed in any of the selected variables during the training period.

Significant changes were seen in VO<sub>2</sub> max (ml/min/kg) in the experimental group following Six weeks of Tabata training. There was significant increase of 10.50% in VO<sub>2</sub> max of swimmers. HIIT session with limited rest would have resulted in the increased VO<sub>2</sub> max. Ziemann *et al.* (2011) <sup>[8]</sup> also agrees with the findings of this research. There is a substantial volume of literature validating the use of HIIT to improve cardiorespiratory fitness Gibala & McGee, (2008) <sup>[5]</sup>. Longer HIIT session coupled with less intense interval appear to provide greater increase in VO<sub>2</sub> peak alone Trapp *et al.*, (2008) <sup>[4]</sup>. Training exercises must be adapted to the sport specific features, such as game duration, percentage of heart rate, work and rest times, effort profiles, running distance, and specific features associated with players' roles and positions in the team.

Significant changes were seen in body fat percentage in the experimental group following Six weeks of Tabata training. There was significant reduction of 11.22% in body fat percentage in the experimental group. This may probably due to the fact that training would have result in the greater utilization of fat stores from the body leading to reduction of body fat. The results of Carrasco *et al.* 2017, also agree with the finding of the study. The HIIT regimens produced significant reductions in the fat mass of the whole body. Trapp, *et al.* (2008) <sup>[4]</sup>; Tremblay *et al.*, (1994) <sup>[2]</sup>. Nevertheless, authors such as Alonso-Fernández *et al.* (2017) <sup>[1]</sup> did not detect significant improvements in this variable in a study conducted with non-athlete teenagers who underwent an 8-week HIIT protocol. Considering that calorie intake and food monitoring have a significant impact on this variable, it is safe to assume that more regular and stable food habits in sportspeople may increase HIIT impact on % body fat.

Lean body mass increased in the experimental group following Six weeks of Tabata training. There was significant increase of 5.50% in lean body mass in swimmers. The HIIT session would have resulted in greater muscle and bone loading leading to increase in lean body mass.

The sessions of the Tabata training programme involved variety of exercise which did bring about an overall development of the physiological domain. The group of exercise to music made the training to pleasurable and meaningful for these experimental group of swimmers, it gave them heightened awareness, joyful feeling, this would be resulted in the improvement of participation in the different type of training. HIIT training in a group, it helps in acquiring new friendship, obtain positive role, self-confidence, enhance self-esteem might have resulted in the improvement of social domain.

## Conclusion

Six weeks of tabata training had proved to be an effective method to improve values in vo<sub>2</sub> max, body weight and lean body mass in swimmers.in practical terms it is relevant to include tabata training in plans devised by coaches and physical trainers for their teams. It has to be adapted to the

specific needs of players training, the volume and intensity and also include diverse exercises and tasks for specific development of physical abilities in swimmers.

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