



Effect of swimming on VO₂ max and aerobic capacity of school boys

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Abstract

The present study is designed to investigate the “effect of swimming on Vo₂ max and aerobic capacity of school boys”. In order to achieve the purpose of the study, 30 school boys were randomly selected from Good Shepherd International School, Palada, Ooty. They were divided into two groups. The group I was considered as experimental group and group II was considered as control group. The investigator did not make any attempt to equate the group. The experimental group was given swimming training for six days per week whereas the control group was not given any training. The experimental group was given training for the period of 8 weeks. The chosen criterion variables were Vo₂ max and aerobic capacity. All the dependent variables were assessed before and after the training period of 8 weeks. The collected data on Vo₂ max and aerobic capacity due to effect of swimming training was analyzed by computing mean and standard deviation. In order to find out the significant improvement if any, ‘t’ test was applied at 0.05 level of confidence was fixed to test the level of significance. The study revealed that the Vo₂ max and aerobic capacity were significantly improved due to the influence of swimming training of school boys.

Keywords : Vo₂ max, aerobic capacity, swimming and training

Introduction

Swimming has four types of conventional techniques namely Butterfly stroke, Back stroke, Breast stroke and free style. Swimming is a cyclic sport in which both bioenergetical and biomechanical factors assume a fundamental performance influencing role. Together with running and cycling, swimming has been, along the years, one of the primary areas of research in Sport Sciences, being object of published scientific experimental studies since the 1930s. From the four conventional swimming techniques, front crawl has been the most studied, possibly due to its highest maximal velocity, and to its generalized use in freestyle events and in training. The fact that front crawl is the fastest swimming technique could be explained by its lower intra-cyclic velocity variation, implying lower energy

expenditure, and higher propulsive efficiency (Prampero, 1986; Toussaint and Hollander, 1994; Vilas-Boas *et al.*, 2011).

Once swimming may be considered as an aerobic sport, in which the anaerobic system contribution has significant influence (Capelli *et al.*, 1998; Gastin, 2001; Figueiredo *et al.*, 2011), maximal oxygen consumption (VO₂ max) plays a central role among the energy-yielding mechanisms (Prampero, 1986). In fact, several authors consider this parameter as the expression of maximal metabolic aerobic performance capability of a subject and, therefore, related to one of the primary areas of interest in swimming training and performance diagnostic (Olbrecht, 2000; Libicz *et al.*, 2005; Rushton, 2007; Sousa *et al.*, 2011). However, and despite the fundamental areas of interest in swimming are already identified

(Smith *et al.*, 2002; Rushton, 2007), the study of the maximum duration of exercise in which the intensity corresponding to the minimum velocity that elicits VO₂ max (V VO₂max) can be maintained is scarcely studied.

Competitive swimming events consist of different distances from 50m to 1500m, and it takes approximately 23 seconds to 14 minutes and 30 seconds to complete swimming those distance events respectively. The required energy to swim a certain distance is supplied by aerobic or anaerobic energy processes, however, the relative importance of each energy process and also exercise intensity vary depending on the exercise time (and thus swimming distance) (Medbø, 1989; Ogita 1996, 1999, 2003). Therefore, it is considered that coaches and swimmers should understand metabolic profile of each swimming distance event, what is more required for the swimmer, and how to strengthen the weak point,

in order to develop effective and distance specific training program. By doing so, the performance could be improved more successfully.

Methodology

To achieve this purpose 30 school boys were randomly selected from Good Shepherd International School, Ooty, Tamilnadu as subjects and their age ranged between 13 and 17 years. They were divided into two groups. The group I was considered as experimental group and group II was considered as control group. The investigator did not make any attempt to equate the group. The experimental group underwent swimming training for six days per week and the control group was not given any exercise. The experimental group was given training for the period of 8 weeks of swimming training programme (Table -1). They understood the purpose of study and all procedures involved, and voluntarily accepted to undergo the procedures.

Table – 1. Swimming training schedule for eight weeks

DAY	ACTIVITY	WEEKS
Monday	Warm-up - Walk/jog in pool for 3 – 5 Minutes, Swim - 10-15 minutes, any stroke disregarding technique. When tired switch on to another stoke of their choice without stopping. If stop, keep the rest short until you are breathing somewhat more easily (keep track of how many lengths completed).	One to Four
Tuesday	Warm-up - Walk/jog in pool for 3-5 minutes, swim - 10-20 minutes, any stroke at all disregarding technique. When tired switch on to another stoke without stopping. If stop, keep the rest short until you are breathing somewhat more easily (try to increase the number of lengths from the 1 st day, even by 1).	
Wednesday	Warm-up - 50 any stroke, swim - any stroke, 2 x 100 (12 breaths between), 2 x 50 (10 breaths between), swim down - Kick with board 2x25	
Thursday	Warm-up - 100 any stroke, swim - any stroke, 2 x 100 (12 breaths between), 2 x 75 (10 breaths between), swim down - Kick with board 2x25	
Friday	Warm-up - free 200 yards, swim - free 4 x 100 (15 sec. rest), 3 x 75 (10 sec. rest), 2 x 50, swim down - Free 3 x 25	
Saturday & Sunday	Rest or recreational activities	

DAY	ACTIVITY	WEEKS
Monday	Warm-up - 100 any stroke, swim - any stroke, 3 x 100 (12 breaths between), 3 x 75 (10 breaths between), swim down - Kick with board 3 x 25.	Five to Eight
Tuesday	Warm-up - 100 any stroke, swim - Free, 3x100 (rest 12 breaths between 100's), 4x50 (rest for 8 breaths between 50's), swim down - kick with board 4x25.	
Wednesday	Warm-up - 200 yards, (rest for 12 breaths between 100's), Swim - free, 3 x 100 yards (rest for 10 breaths), 4 x 50 (rest for 6 breaths), swim down - 4x25 (rest for 4 breaths).	
Thursday	Warm-up - 200 yards, (rest for 12 breaths between 100's), Swim - free 2x100 yards, (rest for 10 breaths), breast 2 x 100 yards, (rest for 10 breaths), back 4 x 50 (rest for 6 breaths), swim down - free 4 x 25 (rest for 4 breaths).	
Friday	Warm-up - 100 any stroke, swim - any stroke, 2 x 100 (12 breaths between), 2 x 75 (10 breaths between) Swim down - kick with board 2 x 25.	
Saturday & Sunday	Rest or recreational activities	

Design

The evaluated parameters were maximum oxygen consumption (Vo_2 max) (Queen’s College Step Test) and aerobic capacity (5 mts Multiple Shuttle Test). The parameters were measured before and after the swimming programme and the effects of the training programme were examined.

Data analysis

The collected data on Vo_2 max and aerobic capacity due to effect of swimming training programme were analyzed by computing mean and standard deviation. In order to find out the significant improvement if any, ‘t’ test was applied at 0.05 level of confidence was fixed to test the level of significance.

Results

The scores of the table reveals the computation of ‘t’ ratio between mean of pretest and posttest of control and experimental groups on Vo_2 max and aerobic capacity of school boys. The mean values of pre and post test on control group were 133.93 and 134.67, and 131.77 and 131.06 respectively. Since the obtained ‘t’ ratio 0.88 and 1.93 were lesser than the required table value 2.145, it was found statistically not

significant for the degree of freedom 1, and 14 at 0.05 level of confidence (Table – 2).

The mean values of pre and post test of experimental group were 131.87 and 127.37, and 131.30 and 134.30 respectively. Since the obtained ‘t’ ratio 10.14 and 4.41 were greater than the required table value 2.145, it was found statistically significant for the degree of freedom 1, and 14 at 0.05 level of confidence. The results clearly indicated the Vo_2 max and aerobic capacity of experimental group improved due to the influence of 8 weeks swimming programme.

Discussion

In this study the subjects who underwent 8 weeks swimming programme were able to improve their fitness on ‘t’ - test. Therefore, it is apparent that there is a positive relationship between swimming and improvement of maximum oxygen uptake and aerobic capacity. This improvement in motor fitness is beneficial for athletes who require motor fitness while performing their sport and support the results from other studies.

Obert *et al.* (1992) used a sample of 13 swimmers and they discovered a statistically

Table – 2. Summary of mean and ‘t’ test for the pre and post tests on Vo₂ max and aerobic capacity of control and experimental groups

Parameters	Group	Test	Mean	Standard Deviation	Mean Difference	‘t’ ratio
Vo ₂ max	Experimental group	Pre	131.87	15.27	4.50	10.14*
		Post	127.37	16.03		
	Control group	Pre	133.93	14.84	0.74	0.88
		Post	134.67	14.49		
Aerobic capacity	Experimental group	Pre	131.30	9.96	3.0	4.41*
		Post	134.30	10.36		
	Control group	Pre	131.77	9.30	0.71	1.93

*Significant at 0.05 level of confidence (2.145)

significant correlation between VO₂ max and swimming performance in 200 and 400 meter freestyle. Hood (2007) conducted a research comprising of 15 male swimmers and 14 female swimmers. He proved that VO₂ max, the stroke length at sub-maximal speed, the stroke index and other parameters are the main predictors of success in the 400m freestyle. In another study which involved only female swimmers, the same authors discovered that VO₂ max has a statistically significant effect on the results of the 400m freestyle (Latt *et al.*, 2009). Nikolic and Ilic (1992) found statistically higher absolute and relative VO₂ max values in swimming cadets in comparison to non-swimmers.

Conclusions

In light of the results of the study and the limits of the sample and the framework of statistical treatments used, the following was concluded:

1. It was concluded that eight weeks of swimming programme produced significant improvement in Vo₂ max of school boys.
2. Eight weeks of swimming programme produced significant improvement in aerobic capacity of school boys.

Recommendations

- (1) Studies may be conducted in the same area on different samples in terms of age and gender.
- (2) The coaches and the physical education personals may attempt the method to improve Vo₂ max and aerobic capacity of their trainees.

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