



EVALUATION OF CARDIOVASCULAR ENDURANCE OF SWIMMERS  
 PARTICIPATING IN COLLEGIATE LEVEL SHORT DISTANCE  
 SWIMMING COMPETITIONS

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**Abstract:** For performing at par with the best swimmers, the athlete needs great physical fitness with cardio-vascular endurance, flexibility and muscular endurance being the most important parameters. The ability to sustain a high intensity is paramount, and hence, a comparative study has been carried out wherein the above mentioned parameters of short (50 and 100 mts. Freestyle events) distance swimmers. The data has been collected from the swimmers participating in the collegiate level tournament by using standard methods. The results of the study showed that there is significant difference in the cardio-vascular endurance, flexibility and muscular endurance of the swimmers participating in 50 and 100 mts. Freestyle events.

**Keywords:** Swimmers, Physical fitness, Cardio-vascular endurance, Flexibility, Muscular endurance

**Introduction:**

Swimming is a great activity that provides a thorough workout to all parts of the body, and is suitable to people of all ages and abilities. Swimming is an excellent form of exercise that workout every single muscle of the body. Although any style of swimming works equally on all the muscles of the body; the muscle involved actively in a particular swimming style tends to exert more as compared to the other muscles. To become a perfect swimmer and get all the benefits of swimming, one should learn all the swimming techniques and strokes since different swimming strokes will put body in different positions and place different demands on the various muscles. This eventually will strengthen muscles and will make a good swimmer. Apart from this, knowing different forms of swimming has got many advantages like swimmers in long time swimming can avoid fatigue by just allowing their body to rest in certain positions. In case of competitive swimmers, knowing different swimming techniques allows them to take part in more than one event. So, do not ignore any swimming techniques and read on to find out the different swimming strokes and swimming techniques.

Maximal performance in swimming depends on the maximal metabolic power

and on the economy of locomotion, measured by the energy cost per unit of distance (Capelli et al., 1995). Swimming performance has been shown to depend on propelling efficiency and the technical skill of the swimmers but also on body drag and buoyancy which are associated with individual anthropometric features (Kjendlie et al., 2004). Swimming offers something no other aerobic exercise does: the ability to work body without harsh impact to skeletal system. Thus, swimming is one of the most popular sports in world with India being no exception. The high number of competitions held is a picture of its popularity demand that the swimmers perform optimally in all the competitions. Moreover, the swimming culture in Nagpur city is very vibrant, which demands that the research activities focusing on the physiological aspects of young swimmers should be given due attention. In view of above, this study is carried out with an aim to investigate the strength and endurance of short distance (50 and 100 meters) swimmers participating in collegiate level competitions.

**Research Methodology:**

**Design of Study and Selection of Subject**

The design of the study was random group design. The subjects were selected from the different swimming clubs of

Nagpur City. In all 120 swimmers were selected randomly with the permission of swimming coaches.

### 1. Selection of Variables

Based on Health Related Physical Fitness and with the discussion of experts and scholar's own understanding the following variables were selected for the purpose of the study. Health Related Physical Fitness variables such as Cardiovascular Endurance, Flexibility and Muscular Endurance were selected.

### 2. Collection of Data

The data was collected for each variable. The tests used were explained to the subjects prior to their administration. Data was collected for each subject personally by the research scholar.

- Cardiovascular Endurance of the swimmers was determined by using The Distance Run Test i.e. 9 Minute Run Test (Kirkendal et al., 1987).
- Flexibility of the swimmers was determined using Sit and Reach Test
- Muscular Endurance of the swimmers was determined using Sit-ups Test

#### Statistical Analysis of the data

The data characteristics (descriptive statistics) such as Mean, Standard deviation, Range, etc. were determined. Independent Paired 't' test procedure was used to assess the difference in mean values for different parameters. The significance level was chosen to be 0.05 (or equivalently, 5%).

#### Results and Discussion:

##### Cardiovascular endurance

Cardiovascular endurance is the most important aspect of fitness. It is basically how strong the heart is, which can potentially help in improving the physical performance of the players. Another reason that cardiovascular endurance is important is because heart controls the oxygen flow to all the muscles - meaning cardiovascular health has a direct impact on the physical performance, both endurance and strength wise.

**Table 1:** Cardiovascular endurance of swimmers participating in short distance (50 and 100 metre freestyle events) swimming competitions at collegiate level

Swimmer's Event	N	Mean	±SD	SE	Min	Max	't' ratio	P
50 metre freestyle	30	542	±84	19	514	682	3.248	<0.01
100 metre freestyle	30	628	±59	23	594	712		

N= Number of observations; SD: Standard deviation; SE: Standard Error; Min: Minimum; Max: Maximum; P: Probability

**Table 1** shows comparative assessment of cardiovascular endurance of swimmers participating in short distance (50 and 100 meter freestyle event) swimming competition at collegiate level. It was observed that the average distance covered by 50 meter freestyle swimmers was 542±84 yards (varied between 514 and 682 yards), whereas that of 100 meter free style swimmers was 628±59 yards (varied between 594 and 712 yards). The comparative assessment of data showed that cardiovascular endurance of 100 meter free style swimmers was significantly ( $P < 0.05$ ) better than the 50 meter free style swimmers.

##### Flexibility

The best swimmers incorporate flexibility training into their regimen for two main reasons. First, as muscles are stretched, the individual fibers lengthen. A longer muscle fiber can create more force when it contracts. So flexibility training helps to increase the muscle's ability to pull you through the water. One of the causes of poor performance in swimming is often due to lack of flexibility, the limitation of range of movement in the joints, in particular the shoulder and ankle joints. It restricts the extent to which a limb can be placed in the water to give maximum effect for efficient stroke technique, hence the speed and endurance of a swimmer will suffer.

**Table 2:** Flexibility of swimmers participating in short distance (50 and 100 metre freestyle events) swimming competitions at collegiate level

Swimmer's Event	N	Mean	±SD	SE	Min	Max	't' ratio	P
50 metre freestyle	30	19	±2.8	0.9	14	25	2.194	<0.05
100 metre freestyle	30	21	±2.4	0.8	16	24		

N= Number of observations; SD: Standard deviation; SE: Standard Error; Min: Minimum; Max: Maximum; P: Probability

**Table 2** shows comparative assessment of flexibility of swimmers participating in short distance (50 and 100 meter freestyle event) swimming competition at college level. It was observed that the average value of sit and reach test of 50 meter freestyle swimmers was 19±2.8 cm (varied between 14 and 25 cm), whereas that of 100 meter free style swimmers was 21±2.4 cm (varied between 16 and 24 cm). It was apparent from the comparative assessment of data that flexibility of 100 meter free style swimming event participants was significantly (P<0.05) more than the that of 50 meter free style swimmers.

**Muscular Endurance**

Endurance can be as, a) the ability of muscle or muscle group to apply force or b) the ability of a muscle or muscle group to sustain a contraction for a period of time. It can also be defined as the ability of a muscle to avoid fatigue. It is reflected by the length of time a muscle can perform repeated muscle actions against a sub-maximal resistance. It can be determined by the maximum number of repetitions performed at a given percentage of an individual's one-repetition maximum. Muscular strength of the athlete is very important in the swimming performance.

**Table 3:** Muscular endurance of swimmers participating in short distance (50 and 100 meter freestyle events) swimming competitions at collegiate level

Swimmer's Event	N	Mean	±SD	SE	Min	Max	't' ratio	P
50 meter freestyle	30	31	±3.4	1.3	26	38	3.228	<0.01
100 meter freestyle	30	39	±4.8	1.8	32	46		

N= Number of observations; SD: Standard deviation; SE: Standard Error; Min: Minimum; Max: Maximum; P: Probability

**Table 3** demonstrates results of the comparative assessment of muscular endurance of swimmers participating in short distance (50 and 100 meter freestyle event) swimming competition at collegiate level. It was observed that the average number of repetitions of sit ups of 50 meter freestyle swimmers was 31±3.4 nos. (varied between 26 and 38 nos), whereas that of 100 meter freestyle swimmers was 39±4.8 nos. (varied between 32 and 46 nos). It was evident from the comparative assessment of data that muscular endurance of 100 meter freestyle swimmers was significantly (P<0.05) better than that of 50 meter freestyle swimmers.

**Conclusions:**

**Cardiovascular endurance**

**Cardiovascular endurance of swimmers participating in short distance freestyle event**

- It may be concluded from the study results that cardiovascular endurance of swimmers participated in 100 meter freestyle is significantly (P<0.05) more than the swimmers participated in 50 meter free style swimming event.

**Flexibility**

**Flexibility of swimmers participating in short distance freestyle event**

- It may be concluded from the study results that flexibility of swimmers participated in 100 meter freestyle is significantly (P<0.05) more than the flexibility of swimmers participated in 50 meter free style swimming event.

**Muscular endurance**

**Muscular endurance of swimmers participating in short distance freestyle event**

- It may be concluded from the study results that muscular endurance of swimmers participated in 100 meter freestyle swimming event is significantly (P<0.05) more than the muscular endurance of swimmers participated in 50 meter freestyle swimming event

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