Relationship between the Lengths of Extremities with Short Sprint Swimming Performance

Jitender Tokas
Research Scholar, Singhania University, Rajasthan, India

Abstract

Swimming performance is a multifactorial phenomenon involving energetics, biomechanics, hydrodynamics, strength parameters and anthropometrics. Short sprint swimming is a sport which requires production of high intensity force in a relatively short period of time. This phenomenon largely depends on the technique in terms of power and the anthropometric characteristics. The present study evaluated the relationship between the lengths of extremities i.e. upper and lower with the 50 m free style swimming performance. For the purpose of the study, 30 swimmers aged 12-14 years, with at least one year experience in sprint events in swimming were selected as the subjects. They selected subjects underwent anthropometric measurements of upper and lower extremity and the swimming performance in 50 m free style event. Pearson Product Moment Correlation was used as the statistical tool to find out the relationship between the lengths of upper and lower extremities with 50 m free style swimming performance. The results revealed that there were negative correlations between the length of upper and lower extremities with 50 m free style swimming performance. These results were found statistically highly significant at $p \leq 0.01$ level of significance. It may be concluded that the length of upper and lower extremities are proved to be good predictors of short sprint swimming performance in young swimmers.

KEYWORDS – Upper Extremity, Lower Extremity, 50m Freestyle Swimming, Descriptive statistics and Pearson Product Moment Correlation

INTRODUCTION

The human physique differs in a thousand ways. It can be analyzed by studying the size, shape and form of an individual. For this purpose, a set of selected anthropometric measurements is taken on an individual. The intergroup comparisons are made to understand the physical peculiarities of a population. From such anthropometric body measurements, it is also possible to estimate the distribution of fat and development of bone muscle in the case of athletes and sportsmen where the physical fitness plays a vital role in the competitive performances. **Tanner (1960)** examined the physique and body composition of Olympic athletes at Rome during 1960, and inferred that the athletes were both born and made.

The measurements of different body dimensions and ratios are of great relevance to the physical activity, especially in sports. The anthropometric assessment of physique includes careful use of body landmarks specific positioning of the subject and use of useful instruments. The measurements that are taken on an individual are highly objective and highly reliable in the hand of a trained anthropometrics. Malina pointed out that the biological or functional significance of many dimensions has not yet been adequately established.

The Competitive sports demand event specific physique and body composition to achieve the success. **De Garay*et al*.(1974)** concluded that top level performance in a particular event demands a particular type of body size and shape, if other aspects

are being similar. Showed high correlation between the body profile of an athlete and specific task (event) in which he/she excelled.

Various other studies also suggest that different body sizes, shapes and proportions are beneficial in different physical activities**. Hirata (1966)** suggested that a nation with people whose general physique is limited to the characteristics of champions in certain events must concentrate their sports training on those specific events only. He also concluded that Japanese with small body-builds are best for gymnastics, long-distance running, boxing and weight lifting etc. whereas the Americans who are large and lean are best for basketball, female Handball, swimming, long jump, short and middle distance running. **Carter(1982)** suggested that the athletes who wish to achieve success in sports at a high level should compare their physique with Olympic athletes. If the athlete's bodily structure is within the limit of the Olympians, he/she may achieve high performance subjected to the optimization of other factors. **Behnke** and **Royce (1996)** concluded that long distance runners are characterized by excessive leanness, relatively small body size and a deficiency of arm girth compared to chest size and leg length. The anthropometric and compositional study on cross-country runners revealed that runners are characterized by a relatively large calf and small biceps and abdominal girths. **Mc Ardle et al**. pointed out those athletes generally have physique characteristics unique to their specific sports. For example field event athletes have relatively large quantities of lean tissues and a high percentage of body fat whereas long distance runners have the least amount of lean tissue and fat mass. He also pointed out that football players are amongst the heaviest and leanest of all sports men.

A lot of research work has been done to establish the relationship between various physiological and psychological parameters and the swimming performance. But, as far our knowledge, there is no literature available which gives a relationship between the physical characteristics with the swimming performance, especially in Indian population. For this purpose, this present study aims to find out the relationship between the lengths of extremities with the short sprint swimming performance.

METHODOLOGY

Subjects

For the purpose of the study, 30 swimmers aged 12-14 years, with at least one year experience in sprint events in swimming were selected as the subjects.

Criterion Measures

The following were the criterion measures chosen for the study:

a. Upper Extremity length was measured with the help of measuring tape in inches.
b. Lower Extremity length was measured with the help of measuring tape in inches.
c. 50 m freestyle swimming performance was measured with the help of digital stop watch in seconds.

Statistical analysis

Descriptive statistics were computed for the data collected and Pearson product moment correlation was used to find out the relationship of upper and lower extremity with 50 m freestyle swimming performance.

RESULTS AND DISCUSSIONS

The results depicting mean and standard deviation of upper extremity length, lower extremity length and 50m freestyle event of swimming has been documented in table-1.

Table 1: The Length of Extremities and 50 m Freestyle Swimming Performance

Variables	Mean	Standard Deviation
Length of Upper Extremity (in inches)	24.50	2.90
Length of Lower Extremity (in inches)	41.31	4.47
50 m Freestyle Performance (in seconds)	35.01	2.06

Table 1 clearly indicates that the mean scores of upper extremity length, lower extremity length, and 50m freestyle performance were 24.50, 41.31, and 35.01 respectively. Further table 1 also indicates the standard deviation values of upper extremity length, lower extremity length, and 50m freestyle performance were 2.90 (inches), 4.47 (inches), and 2.06 (seconds) respectively.

Table 2: Relationship between the Lengths of Extremities with 50 m Freestyle Swimming Performance

Relationship between Variables	'r'
Upper Extremity with 50 m freestyle performance	**- 0.890****
Lower Extremity 50 m freestyle performance	**- 0.705****

** Significant at 0.01 level of significance.

Table No. 2 indicates the calculated values of product moment correlation upper and lower extremity with 50 m freestyle performance of the selected subjects. Further, it is evident from the above table that there was a significant negative relationship of upper and lower extremities with 50 m freestyle performance. It means if an individual have long upper and lower extremities then individual complete 50 m freestyle event in less time or in other words we can say if an individual have long upper and lower extremities then individual perform well in 50 m freestyle event. Similar findings were observed in terms of girths, diameters, breadths, height and weights, which shows positive correlations with muscle power of the swimmers, maximal strength performance of extremities and trunk and the swimming performance in short distance races. The researchers indicates that an increase in the value of girths, diameters or breadths results in increased power values which enables a swimmers to performs high intensity short distance swimming sprints. The similar study also showed that taller swimmers performed better on the power testing as compared to shorter swimmers. A large cross sectional area of the muscle presents with increased muscle strength generating characteristics. And, due to skeletal and hormonal maturity during childhood and adolescence, increase in the muscle performance resulted due to muscle related changes in the muscle enzyme activity, an increased proportion of type II fibres etc. According to the same study, pubertal development led to greater muscle mass and force production due to increased height and bone length. On the other hand, short sprint swimming required short bursts of high intensity activity which was further dependent on muscle cross sectional area and fibre distribution according to yet another study. Thus, these results supported the relationship of lengths of extremities with short sprint swimming performance in our study.

CONCLUSIONS

Thus the present study was useful in determining the performance aspects of the swimmers based on their anthropometric profile. Also, the present study helps in concluding that the length of the extremities had a negative significant correlation with the short sprint swimming performance.

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