

INFLUENCE OF ANTHROPOMETRY ON SWIMMING SPEED

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Abstract

The purpose of this paper is researching influence of anthropometric characteristics on swimming speed. The main question is: can swimmers with longer hands and legs have better results in specific swimming techniques? Therefore, I decided to carry out the research working with children in Academic swimming club Zrinjski. The swimming club Zrinjski gave the requirement for the research and it is approved by swimmers' parents. All the measurements were done on Faculty of Science and Education in Mostar. The examinees sample consists of young male and female swimmers, aged 11 to 14 years (n=24, 14 boys and 10 girls), all of them being members of Academic swimming club Zrinjski. During the testing, we were using anthropometric measurements according to IBP. The measurement is prescribed by International biological programme IBP which prescribes 39 measurements and enables result comparison. IBP predicts that measuring symmetrical parts of the body is to be processed on the left side of the body (Mišigoj-Duraković, 2008). The measuring is done based on anthropometric spots. There are also different limitations to be taken into consideration when generalizing and explaining the results. Testing was carried out in only one swimming club with 24 swimmers, also, it must be mentioned that the tested swimmers are at sensitive age of puberty, which means that they are growing and developing and this can also influence on swimming speed and results. I found out that anthropometry has not significantly influenced swimming speed in four swimming techniques.

Keywords: swimming, anthropometry

INTRODUCTION

The topic and the purpose of this paper is researching influence of anthropometric characteristics on swimming speed. In another words, the main question is: can swimmers with longer hands and legs have better results in specific swimming techniques? Based on research of this or similar theme it can be concluded that the results depend on swimming abilities, and not only on anthropometric characteristics.

Speed swimming and energy consumption depend on laws of water medium, so they determine propulsion, body position in water, energy consumption and space structure of motoric abilities of swimmers with dominant strength, speed, flexibility and coordination (Volčanšek, B., 1995). Therefore, I decided to carry out the research working with children in Academic swimming club Zrinjski. I thought that testing them would prove me some presupposed results. I found out that anthropometry has not significantly influenced swimming speed in four swimming techniques. There are also different limitations to be taken into consideration when generalizing and explaining the results. Testing was carried out in only one swimming club with 24 swimmers – 14 of them are boys and 10 of them are girls. The results cannot be understood as widely representative among population of young swimmers. Also, it must be mentioned that the tested swimmers are at sensitive age of puberty, which means that they are growing and developing and this can also influence on swimming speed and results. The tested children are not involved in swimming equally in terms of time, so the research is also limited by that fact.

PURPOSE OF THE RESEARCH

The purpose of this research is to establish the connection between anthropometric abilities and swimming speed, also to evaluate how and to what extent anthropometry influences swimming speed in all four swimming techniques.

Research hypothesis

The following hypothesis can be set in the research:
H1: Anthropometric variables have significant influence on swimming speed in all four swimming techniques.

RESEARCH METHODS

Examinees

The examinees sample consists of young male and female swimmers, aged 11 to 14 years (n=24, 14 boys and 10 girls), all of them being members of Academic swimming club Zrinjski.

Variable samples

During the testing, we were using anthropometric measurements according to IBP, i. e. body height, length of left and right arm, length of left and right leg, length of left and right fist, length of left and right foot, shoulders width, left and right fist width, left and right foot width, thighs volume, lower leg volume, left and right upper arm volume, left and right forearm volume, stomach volume and crinkles.

Measure instruments

Morphological anthropometry is the method which includes measuring of human body and processing and researching of obtained measurements. It is applied in many areas, such as kinesiology sports and recreation. In morphological anthropometry we

use methrical system, i. e. basic measuring units of methrical system.

Short explanation of anthropometric characteristics measuring method:

The measurement is prescribed by International biological programme IBP which prescribes 39 measurements and enables result comparison. IBP predicts that measuring symmetrical parts of the body is to be processed on the left side of the body. The measuring is done based on anthropometric spots. These spots are determined by inspection, palpation and marked with demographic pen and it should be all done before the measuring itself. Anthropometric spots are divided into fixed anthropometric spots and virtual ones.

Anthropometric instruments:

1. scale
2. anthropometer
3. pelvimeter
4. kefalometer
5. sliding caliper
6. caliper
7. centimeter tape

Along the anthropometric measurements, swimming speed was measured on the distance of 25 metres for all four swimming techniques.

Stopwatch was used for measuring the speed and the task was to swim out the given distance in as shorter amount of time as possible. The speed is

measured operatively on the distance of 25 metres. The maximum speed is accomplished couple of metres after diving out of water after the start sign, then that speed lasts for 10 - 15 seconds, afterwards it decreases.

Data processing methods

The research data were processed according to STATISTICA Version 7, Statsoft, Inc. (2005) System.

The following statistic procedures have been used: Descriptive statistics – for determining descriptive parametres of anthropometric tests and test of swimming speed on 25 metres distance in backstroke, breaststroke, butterfly and freestyle techniques

Regressive analysis – for determining influence of anthropometric characteristics on swimming speed.

RESULTS

Descriptive statistics

Descriptive statistics was used to determine arithmetic mean, standard deviation, minimum and maximum results, skewness (distribution asymmetry) and kurtosis (extention measure) in all anthropometric and speed tests of swimming in all four techniques. The results are given in

Table 1. Results of swimming speed

Variable	Descriptive statistics					
	AS	MIN	MAKS	SD	ASD	MJI
25mK	18,82	14,00	22,16	2,393	-0,50	-0,86
25mP	24,41	18,00	30,08	3,314	-0,14	-0,56
25mL	22,74	17,57	28,10	3,038	-0,19	-0,83
25mD	23,87	16,39	33,04	4,506	0,13	-0,87

Table 1. shows results of swimming speed in all four swimming techniques. It is obvious that arithmetic mean in freestyle technique is 18.82, breaststroke 24.41, backstroke 22.74, butterfly 23.87, so it can be

concluded that freestyle is the fastest technique, and breaststroke is the slowest one. Minimum and maximum result is also given for all four swimming techniques.

Table 2. The results in all variables used are normally distributed

Variable	KS test		
	N	maks D	K-S p
25mK	24	0,13	p > .20
25mP	24	0,12	p > .20
25mL	24	0,11	p > .20
25mD	24	0,13	p > .20

This given table shows that the reulsts in all variables used are normally distributed, i. e. none of the distributions deviates significantly from the normal, Gauss distribution (p = 0, 20).

Regressive analysis

Is used to determine influence of anthropometric abilites on swimming speed in all four techniques.

Table 3 and 4. Results of regressive analysis freestyle

Statistics	Regressive analysis: 25m K	
	Value	
R	0,90	
R ²	0,81	
Adjusted R ²	0,11	
F	1,15	
p	0,48	

Statistics	Regressive analysis: 25mK	
	Value	
R	0,85	
R ²	0,72	
Adjusted R ²	0,47	
F	2,83	
p	0,04	

As it can be seen from the given tables, set of predictors variables multiple correlation coefficient (anthropometry) with criteria variable (freestyle swimming speed) is $R=0.89$ in the first table and $R=0.85$ in second table. The mistake in the first table is $p = 0.47$, and in second one $p = 0.04$. Concerning the mistakes we cannot definitely conclude that the connection is significant and that the given predictor variables significantly explain variance of criteria variable, i. e. freestyle swimming speed. The results of partial regressive coefficients show that none of the predictor variables used has statistically significant connection with criteria variable on level $p < 0.05$. It can be concluded that none of the mentioned anthropometries has influence on freestyle swimming speed. The Table shows that determined coefficient of multiple correlation between anthropometry and breaststroke swimming technique is 0.75 in the first table, 0.72 in second table, and the testing mistake is $p = 0.95$ (first table) and $p = 0.38$ (second table). It can be concluded that anthropometry does not influence on swimming speed in breaststroke technique. The explained part of criteria variable variance is $R=0.57$ in the first Table, and $R=0.52$ in the second Table. The other, unexplained part of variance is 43 in the first Table and 48 in the second one, which means that there are other capabilities influence on swimming speed, which were not the subject of this research.

Analyzing influence of anthropometry on backstroke swimming technique, multiple correlation coefficient is determined, and it is $R=0.79$ in the first table and $R=0.76$ in the second one. The explained part of criteria variable variance is $R^2=0.62$ in the first Table, and $R^2=0.57$ in the second one, which means that the unexplained part which can influence on the results is 38 and 43. Testing mistake is $p=0.90$ in the first table and $p=0.26$ in the second one, but it cannot be certainly concluded that this connection is significant and that anthropometry influences backstroke swimming speed. The tables shown prove that multiple correlation coefficient is $R=0.86$ in the first table and $R=0.88$ in the second one. Mistake in the first table cannot be seen as statistically significant, as the mistake of statistic conclusion is over 0.05 (it is $p=0.69$, to be more

precise), while in the second table it can be stated as significant because $p = 0.02$, which means it is under permissible value of 0.05.

The only significant anthropometric variable which influences on the swimming speed in butterfly technique is NABL (crinkle), with mistake of 0.04 Beta (standardized partial regressive coefficient) is 0.90, while B (non-standardized regressive coefficient) is 1.0.

DISCUSSION

The aim of the research was to determine influence of anthropometric abilities (body height and weight, arm extent, hands, legs, fist, feet length, shoulder, fist, feet width, crinkles, upper-arm, forearm, stomach, thighs volume and crinkles) on swimming speed in all four techniques, backstroke, breaststroke, freestyle, butterfly stroke. The research has been carried out among 24 swimmers of Academic swimming club Zrinjski in Mostar, age-ranged 11 to 14, fourteen of them boys and 10 girls. The swimmers underwent anthropometric measurements and speed measurement on 25 metres distance in breaststroke, freestyle, butterfly and backstroke technique. The results were descriptively statistically processed and the results of arithmetic mean, minimum and maximum results, kurtosis (extension measure), skewness (distribution assymetry) and standard deviation were viewed.

Regressive analysis was used to determine comparison of anthropometry influence on swimming speed in all four techniques. Four regressive analysis were calculated, with equal set of predictor variables (results of anthropometry measurements), and with different criteria variable, i. e. swimming speed in all four swimming techniques.

The given results show that anthropometric characteristics in the beginning of one's swimming career have no significant influence. In the early age swimming technique should be perfected, and later, when all the techniques can be well performed and automatized, certain influence can be proven. When it comes to high level swimming quality, even the smallest details can influence swimming speed and the swimmer's achieved time. On that level,

anthropometric characteristics have strong influence on one's swimming speed on a certain distance.

CONCLUSION

Research on influence of anthropometric abilities on swimming speed has been carried out among 24 swimmers of Academic Swimming club Zrinjki, Mostar. Some measurements have been done (body height and weight, arm extent, arms, legs, fist, feet length, feet, shoulder, fist width, upper arm volume, forearm volume, thighs and stomach volume, and

crinkles), as well as swimming speed on 25 metres distance in freestyle, backstroke, breaststroke and butterfly technique. It has been proven that suggested anthropometric variables do not influence significantly on swimming speed in all four swimming techniques.

The testing included relatively small number of examinees, all of them being age-ranged 11 to 14, when children enter the period of intense growth and development, which can influence results and swimming techniques of examinees.

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