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THE IMPACT OF ANTROPOMETRIC DIMENSIONS ON THE RESULTS OF THE BREASTSTROKE TECHNIQUE SWIMMERS

Summary

Morphological status of athletes is a significant component that affects the functional ability of the body and conditions the predisposition of the human body for certain sports activities. Swimmers are extremely conditioned by their body morphology in which anthropometric characteristics are very visible, perhaps more than with any other athlete. The buoyancy of swimmers depends on the anthropometric sizes, such as: height, weight, layout of center of gravity and the thrust and the vital capacity. Swimmers are diveded by swimming techniques according to the ratio of muscle mass and quality of the same, the length of limb and joint mobility. Breaststroke swimming technique,by its coordination is the most complicated technique. Swimmers of breastsroke swimming technique are specialised for breast swimming in early period and they possess certain specific morphological characteristics in comparison to the swimmers of the other swimming techniques. The study of anthropometric characteristics and correlation with the results of the breaststroke techniques among swimmers were analyzed with 82 male swimmers who compete in the Winter Belgrade league in the year 2006.

Keywords: anthropometry, swimming, result, selection, breaststroke technique.

INTRODUCTION

Morphological status is one of the most important factors for the evaluating the progress possibility and the choice of top swimmers.

Applying the system of anthropometric measurements, we get more precise information about the optimal physical development of athletes. The peculiarity of body structure affects the level of manifestation of a number of specific characteristics of swimmers (buoyancy, hydrodynamic body position in the water, muscle tissue, etc.). Technique and the choice of the type of swimming also depend of the body characteristics. Therefore, the performance of athletes in a number of sports is significantly related to his anthropometric status that continues to affect the bio-motor abilities of athletes.

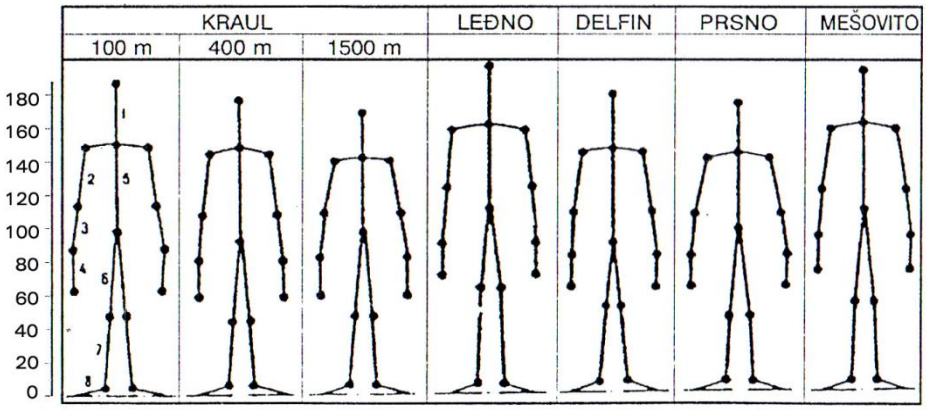
In the process of selecting talented athletes there are two groups of indicators (Zaciorski, 1974). Some are called ´Conservative´ indicators, and other ´non-conservative´. The name

indicates that the stable indicators are very difficult to change i.e. to affect their development by training process. Among the stable indicators in the first place are physiological, anthropometric parameters, and then the reaction velocity of arms and legs, where the coefficient of heritability is 0714-0857, which means that the reaction time is greatly influenced by genetics.

Morphological status of athletes is a significant component that affects the functional abilities of the body and conditions the predisposition for certain sport activities. Swimmers are extremely conditioned by their body morphology in which anthropometric characteristics are very visible, perhaps more than with any other athlete. The buoyancy of swimmers depends on the anthropometric sizes, such as: height, weight, layout of center of gravity and the thrust and the vital capacity. . Swimmers are diveded by swimming techniques according to the ratio of muscle mass and quality of the same, the length of limb and joint mobility.

Between the crawl technigue sprinters and longdistance swimmers there are significant differences in height,weight and chest circumference.Diferences are also noticeable in other techniques, so that the backstroke technique swimmers fall into the group with the largest longitudinal measurements. They are relatively lightweighted with a large volume of breast and and with large absolute surface. Backstroke technigue swimmers are relatively small and heavy.

Swimmers specialists of the crawl technique are different by height, weight and scope of chest depending on the sections. Body weight is correlated with the strength that is needed for velocity-strong locomotion in the 100m. Long-distance runners are visibly lower morphological parameters because functional abilities occupy important place in their results. Swimmers of middle lines are according to their morphology between sprinters and long distance runners. Backstroke technique swimmers are higher than the others because this is a significant predisposing factor for the success. They have a large chest circumference, like the crawl sprinters, while their weight in relation to height is minimal. Specialists in the chest and a dolphin style have approximately the same values in the so-called total proportions, indicating that these parameters are not crucial for these two techniques. Swimmers of chest techniques are somewhat heavier. At crawl, breaststroke and backstroke technique swimmers relatively long limbs of legs were noted, while at the dolphin technique swimmers very short legs were noted. Crawl and backstroke technique swimmers have relatively long arms while breaststroke and dolphin style swimmers have shorter arms. The widest shoulders have crawl sprinters and dolphin style swimmers (Figure 1).



Slika 1. Skeletne (longitudinalne) mere plivačica (1. dužina gornjih delova, 2. dužina nadlaktice, 3. dužina podlaktice, 4. dužina prstiju 5. dužina trupa, 6. dužina nadkolenice, 7. dužina podkoleni 8. dužina stopala) (Bulgakova, 1979)

The goal of the research

The main objective of this research among selected sample of swimmers is to determine:
- *The value of the anthropometric variables at swimmers in the chest swimming technique*

- *Measurement of criterion variables and*

- *Correlation of anthropometric dimensions with the criterion variables in the chest swimming technique.*

METHOD OF RESEARCH

Sample of respondents

This study involves two groups of variables: anthropometric - for the definition of morphological status of the subjects and the criterion - refers to the swimming speed and the number of strokes among swimmers. Starting from subject and objective of the research, the sample of 27 anthropometric variables is established and the three criterion variables in each swimming technique.
27 antropometric variables were applied for evaluation of morphological characteristics, according to the International Biological Program (IBP)procedure established and outside it, such as:
1 The longitudinal dimension of the skeleton;
2 Transversal dimensionality of the skeleton;
3 The volume and body mass and
4 Subcutaneous fat depot.

The measurement was performed in the morning, with the instruments of standard production, always calibrated before the measurement.

Antropometrical variables

A)he longitudinal dimension of the skeleton:
1 -body height - AVIS
2 -leg length - ORK
3 -arm length - ADRU
4 -foot length - ADST
5 -length of hand - ADSA
B) Transversal dimensionality of the skeleton:
6 -shoulder width - ABAR
7 -the width of the pelvis - ABCRO
8 -wrist diameter - ADRZ
9 -elbow diameter - ADLA
10 -knee diameter - ADKO
11 -foot diameter - ADST
12 -foot width – ASSA
C) The volume and body mass:
14 -body mass - ATEZ
15 -medium scope of chest- ASOG
16 -circumference of upper arm - AONL
17 -circumference of forearm - AOPL
18 -The scope of lower leg - AOPK
19 – D) Subcutaneous fat depot
20 - forearm skin fold (two variants) - AKNN
22 -forearm skin fold - AKNP

23 -skin fold of back- AKNL
24 -abdominal skin fold - AKNT
25 –skin fold of chest - AKNG
26 -skin fold of lower leg - AKNP
27 -forearm skin fold - AKNN he scope of thigh – AONK

Criterion variables

1 -swimming time in the 25 m,
2-swimming time in the 50m
3 -the number of strokes in the 50m race.

Program and measurement procedures

The research was conducted during the racing season, the league of Belgrade in the year 2006. The results of the competition which took place in Belgrade at the pool SC ´Vracar´ (semi-Olympic) were taken as the criterion variables, and measurements of anthropometry were performed in infirmary SC ´Vracar´. The team of examiners for the measurement of anthropometric variables was composed of three experts.

Statistical analysis of data

Data obtained in the manner described in the previous section were analyzed using descriptive and comparative statistics, using the computer program of SPSS 15.

Mean (M), standard deviation (S) and coefficient of variation (V) were calculated within the descriptive statistics for all variables of different groups (according to the techniques of swimming and age periods). **Correlation analysis** was applied within the comparative statistics to describe the relationships between anthropometric and criterion variables in the different groups.

Results of research

Research results are shown in the tables which are set to determine the logical course of interpretation. At first, the results of basic descriptive statistical parameters of anthropometric variables (Table 1) were shown , followed by interpretation of the results that includes the correlation analysis between anthropometric and criterion variables and confirms the correlation between these parameters (Table 2).

Table1. Descriptive analysis of Breast Stroke swimmers (N=82)

VARIJABLES	BREAST STROCE		
	M	S	V
TM	53,82	15,74	0,29
TV	163,60	15,54	0,09
DUNO	94,06	8,88	0,09
SIRA	36,09	3,99	0,11
SIKA	25,35	2,76	0,10

DILA	6,46	,71	0,11
DISA	5,38	,52	0,10
DUSA	17,03	1,93	0,11
SISA	7,50	,83	0,11
OGR	82,04	10,75	0,13
ONL	24,55	3,88	0,15
OPL	22,97	2,80	0,12
ONK	49,72	6,61	0,13
OPK	33,09	3,95	0,12
BI	5,28	2,98	0,56
PL	5,38	2,10	0,39
GR	6,46	5,06	0,78
TR	12,50	10,09	0,80
NK	14,79	7,12	0,48
PK	11,36	5,47	0,48
TRIC	10,52	5,21	0,49
SUSK	7,37	4,07	0,55
DIKO	9,40	,70	0,07
DIST	7,32	,47	0,06
SIST	8,63	,88	0,10

DUST	26,24	2,26	0,08
DURU	70,37	7,12	0,10
STAZ	54,29	33,76	0,62

Table2. Correlation of parameters among Breast Stroce swimmers (N= 82)

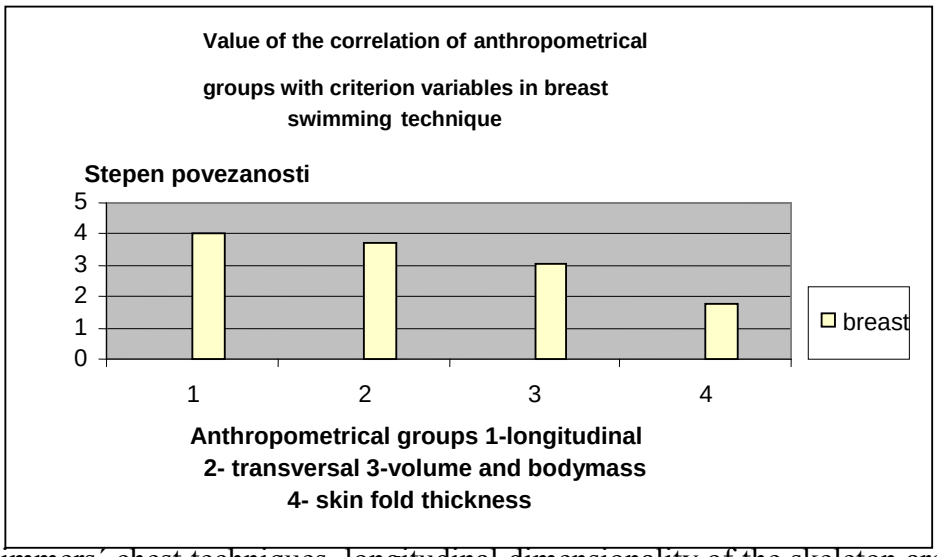
VARIJABLES	BREAST STROCE		
	25 m	50 m	br.zav
TM	-,632 ,000	-,690 ,000	-,635 ,000
TV	-,738 ,000	-,757 ,000	-,722 ,000
DUNO	-,694 ,000	-,715 ,000	-,686 ,000
SIRA	-,760 ,000	-,781 ,000	-,748 ,000
SIKA	-,626 ,000	-,675 ,000	-,609 ,000
DILA	-,669 ,000	-,685 -,685	-,683 ,000
DISA	-,661 ,000	-,713 ,000	-,710 ,000
DUSA	-,739 ,000	-,763 ,000	-,746 ,000
SISA	-,688 ,000	-,727 ,000	-,685 ,000
OGR	-,764 ,000	-,773 ,000	-,715 ,000
ONL	-,616 ,000	-,672 ,000	-,616 ,000
OPL	-,618 ,000	-,700 ,000	-,651 ,000
ONK	-,485 ,002	-,553 ,000	-,520 ,001
OPK	-,499 ,001	-,593 ,000	-,540 ,000
BI	,339 ,035	,301 ,063	,315 ,051
PL	,369	,378	,351

	,021	,018	,029
GR	,283 ,081	,226 ,166	,262 ,107
TR	,115 ,485	,016 ,922	,083 ,615
NK	,316 ,050	,264 ,105	,260 ,110
PK	,379 ,017	,280 ,085	,288 ,076
TRIC	,287 ,077	,228 ,162	,268 ,099
SUSK	,063 ,704	,064 ,700	,039 ,814
DIKO	-,471 ,002	-,524 ,001	-,471 ,003
DIST	-,617 ,000	-,654 ,000	-,565 ,000
SIST	-,631 ,000	-,675 ,000	-,648 ,000
DUST	-,687 ,000	-,706 ,000	-,666 ,000
DURU	-,706 ,000	-,737 ,000	-,709 ,000
STAZ	-,511 ,006	-,504 ,007	-,405 ,036

DISCUSSION

Based on the research results and their interpretation, it is presented the discussion that explains the values of the parameters and compares them with the results of previous studies. The degree of correlation (1-4) among anthropometric groups in chest swimming techniques is graphically presented on the basis of the relations.

Figure 1 Correlations in swimmers chest technique



Among swimmers´ chest techniques, longitudinal dimensionality of the skeleton are also well connected with the criterion variable, mostly with the score at 50 m TV (- 757), DUNO (-, 715), DUSA (-, 727), DUST (-, 706) and DURU (-, 737). The values of these parameters show inversely proportional correlation with speed of swimming at 25 and 50 m and the number of strokes at 50 m. It is explained that limb length increases the speed and reduces the number of strokes, as with the other techniques. At transversal measures, the largest correlation was noticed with the score at 50 m, with: SISA (- 675), DISA (-, 713) SISA (727), DIST (- 654) and SIST (-, 675). Correlation is inversely proportional, except for SISA, which means that with the increase of the width of the transverse measures, the result at 50m is better. Weaker correlation is showed only with the results of DIKO at 25 m (- 471), with the results of DISA at number of strokes (- 471) and with DILA swimming at 50m (- 685 to sig.0, 685). This shows that the width of the joints is less important for the swimming speed and for the number of strokes at 50 m in chest techniques among swimmers. TM and scopes have the highest correlation with the result at 50 m, as follows: TM (- 690) OGR (- 773), ONL (- 672), OPI (-, 700), ONK (- 553) and OPK (- 593). These results show that the transverse measures of the body have very bigger correlation with the score at 50 m, while with the result at 25m and with the number of strokes it is smaller and inversely proportional. So with the increased volume and body weight result is improved (that is the development of muscles and increase of muscular mass). With the variables of DKN, only significant correlation is with swimming at 25 m of DKNBI (315) and DKNPL (369) and with the number of strokes of BI (315). This means that with increasing DKN parameters, the result at 25 meters is increased. This confirms the claim that swimmers of chest techniques have greater arm muscle mass involved because it increases the efficiency of the propulsion stroke. Parameters DKN GR, NK, PK, TRIC are less connected with all criterion variables. This leads to the conclusion that the result and the number of strokes have insufficient influence on the value of these parameters, while TR and SUSK crease have no correlation with the criterion variables. This research shows that the chest technique swimmers results do not dependent on the amount of fat in these muscles.

CONCLUSION

The study was conducted in order to determine the degree of correlation between swimming speed and the number of strokes, on the one hand, and relevant anthropometric dimensions, on the other hand. . We examined 82 male swimmers, who participated in the Belgrade´s winter league in the year 2006, and we can conclude the following:

- The results of descriptive statistics can be used in the selection of swimmers at a certain age.

- In the total sample of respondents, the largest association is among anthropometric and criterion variables, longitudinal and transversal dimensionality and less association is among volume and body mass of swimmers. These groups of variables of swimmers correlate well with the results and the number of strokes at breaststroke technique and they are inversely proportional.
-There was a statistically significant correlation among many of variables tested and criterion variables. The better correlation is of anthropometric variables with the result than with the number of strokes, which means that anthropometric variables more affect the results , while for the number of strokes other factors are apparently significant(mainly training);
- The results obtained in this study provided a basic overview of the importance of anthropometric dimensions and their association with the criterion variables for evaluating the success of young athletes in swimming. At the same time, the level of interconnectedness of these dimensions with the criterion variables indicates those parameters that can be considered as good predictors for improving the results.
The results of this study provide an opportunity to swimming clubs and all swimming workers in Serbian Swimming Federation to conduct an adequate selection of the young swimmers by swimming techniques, to monitor the physical development of their competitors and to achieve better prediction of better performance in relation to certain anthropometric size.

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