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The impact of morphological indices on some swimming parameters (Case of Algerian Sprinters swimmers)

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Abstract : The main objective of this study is to demonstrate the link between sports performance in Algerian swimmers and anthropometric index . The study will allow us to answer several questions about the paths of our best swimmers and their specializations. The resolution by statistical correlation analysis, will define the homogeneity of the morphological profile compared to the sports results of the best Algerian swimmers . We opted to study the swimmers sprinters of the 50 meters crawl.

Keywords: Morphological index , swimming parameters, Sprinters swimmers.

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The impact of morphological indices on some swimming parameters

(Case of Algerian Sprinters swimmers)

1. INTRODUCTION

Learning to swim is based on several factors, where the practice of this discipline takes place in an environment that is not the natural environment of man. The Beginners swimmers learn their support, their balances on the water surface and their position they are confronted on the surface and underwater. The main objective at the start of learning is to readjust to this aquatic environment and of course to move . Young learners are distinguished from each other by the way they assimilate and adapt to multitudes of exercises in this fluid environment , however the morphology of the swimmers on the other hand does not influence the swimmer's learning at this age. The morphological characteristics of young swimmers have a very weak correlation with the results achieved, although these results are of great importance in swimming selection demonstrated by the Bulgakova study (Bulgakova, 1990). And during the test of Wingate, Duchy and all. (1993) observed that anthropometric variables had a less important influence on performance than bioenergetics capacities such as VO₂max. (Duchy P, 1993). The other important factor at the beginning of learning to swim is The notion of Swimming amplitude and frequency which appear at the very beginning of sports training in racing swimming, it is as one of the fundamental elements in the teaching of swimming. current swimming and training. Of course, the identification of a good efficient propulsion (mechanics and energy) does not escape this equation, which seems an essential index of sporting success (the time taken) (VERGER, 1993). Craig and al (1979) demonstrate the close relationship between the number of propulsive cycles, the distance swam per cycle and the speed of swimming in competition. They propose to calculate a propulsion index at the base of the distance swam per cycle. (Craig, 1979) . For swimming specialists, the morphological profile of the swimmer seems to be one of the factors that could affect the results (Sports performance), and according to Bulgakov, the selection of the specialty of specialist swimmers is made primarily by a morphological distinction. of each specialty. (Bulgakova, 1990).

From this analysis, we decided to study the orientation of our Algerian swimmers sprinters, on what parameter were based for the choice of their specialties and what anthropometric criteria that can impact sports results. Does the energy efficiency of the propulsive gesture correlate with a morphological and well-defined profile of Algerian sprinter swimmers?

Our study will be established by an analysis of swimming index during a competition, final phase (national winter championship January 2020) on the Men's 50-Meter crawl. Scheduled tests for the eight finalists of the race, anthropometric measurements, and the evaluation of some swimming index . Does the Algerian swimmer sprinter have a well-defined characteristic that will distinguish him and help him in the future for his choice and his orientation? This question that we will answer during this research, by means of a correlative study between the anthropometric parameters, and some functional index in a sprint race (50 Meter crawl)

We assume in this research that Algerian swimmers systematically orient themselves to sprint races without reference to morphological cues. Their orientation is based only on athletic performance (time realized). At the end we try to draw a morphological profile of our Algerian sprinter swimmers at least on a 50 meter Crawl race.

2. Methods

2.1 Population

We selected 8 swimmers (men) finalists of the Algerian 50 Meter Crawl Winter Swimming Championships. The competition took place in Algiers from January 21 to 25, 2020 including 209 athletes entered on the 50 Meter crawl in 27 series. Our eight swimmers in the final of the 50 Meter crawl from a population of national-level sprinters swimmers and who achieved the best times for a qualification to the final are therefore our subjects of this experiment. The competition took place in Algiers in January 2020 and lasted 5 days for 10 sessions in all, the morning heats and the finals in the evening. The absence and irregularity of an element to continue the experimentation program, prompted us to put this element aside so as not to distort our results and to choose at the end a group of 7 swimmers.

2.2 Experimental protocol

The study takes place in a period of competition where our work focuses on investigating and making anthropometric measurements and calculating morphological index . This is to recover bodily information; the body folds, weight, height, length of the feet, and the final performance (time realized) of the subjects we have chosen. The 7 finalist athletes on the 50 meter Crawl Underwent the same

The impact of morphological indices on some swimming parameters (Case of Algerian Sprinters swimmers)

tests and with the same measuring tools, height (tape) and weight weighing person (KG) length of the feet (tape) skin folds (pliers) and electronically timed (seconds) for the sporting result and then calculate the swimming index of each swimmers after viewing the videos of the race from several angles.

Among all the anthropometric measurements characterizing swimmers, we have chosen to take the characters on which the most obvious morphological differences between individuals are based: Weight, Height, Skin folds (folds of the forearm, arm, belly fold , under scapular, thigh, leg, and pectoral) and Circumferences (circumference of the forearm, arm, thigh and leg).

And for The index retained for our study are as follows: the IBM index, the relative mass of fat and the relative mass of muscle.

For the evaluation of athletic performance, The 50 Meter Crawl is the event we have chosen to assess this athletic achievement as a sprint.

Test of the number of strokes or the frequency of the arms on a 50 Meter swimming in a 25 M pool. The test consists of counting each stroke of the arm made during the entire 50 meter Crawl test.

The calculation of the IP propulsion index which is the result of the equation between swimming speed, swimming amplitude and its frequency.

$$IP = \text{average swimming speed (second / meter)} \times \text{swimming amplitudes (meter)}$$

The statistical analysis was carried out by applying the "r" correlation test formula, which will allow studies of the relationship between several parameters. (Excel computer tool) .

3. Results

We notice in Table 1, a multitude of correlation characters, which varies from low to a very high value, from $r = 0.03$ to $r = 0.95$. In fact, our study focuses on the correlation between the morphological parameters and the results of the swimmers represented by the swimming index.

With an error tolerance degree of 0.05, that is to say 5% of tolerated errors, our statistical table gave us the tabulated r which is equal to 0.754492. Hence we can define our significant results or the calculated "r" greater than or equal to this value (tabulated r) represents a very significant result.

3.1 The correlation between morphological parameters and swimming parameters in Algerian sprinters (50 meter crawl).

Table 1 The correlation between morphological parameters and swimming parameters in Algerian sprinters (50 meter crawl).

Table 1: Demonstrating the correlation between the studied parameters, anthropometric and swimming indices of Algerian sprinters in a 50 meter Crawl.

	AGE	WEIGHT	HEIGHT	FOOT LENGTH	BODY SURFACE	BMI	FAT%	MUS %	SWIM SPEED	FREQ	PERF	AMP	IP
AGE	1,00												
WEIGH	0,84	1,00											
HEIGHT	0,62	0,72	1,00										
FOOT LENGTH	0,67	0,88	0,86	1,00									
BODY SURFACE	0,80	0,95	0,91	0,94	1,00								
BMI	0,63	0,76	0,11	0,46	0,51	1,00							
FAT%	-0,82	-0,60	-0,15	-0,25	-0,44	-0,73	1,00						
MUS %	-0,73	-0,48	-0,70	-0,54	-0,62	-0,03	0,44	1,00					
SWIMMING SPEED	0,58	0,76	0,19	0,58	0,56	0,92	-0,52	-0,13	1,00				
FREQUENCY	-0,31	-0,31	0,00	-0,33	-0,19	-0,46	0,10	0,11	-0,71	1,00			
PERF	-0,60	-0,77	-0,20	-0,58	-0,56	-0,92	0,54	0,15	-1,00	0,70	1,00		
AMPLITUDE	-0,31	-0,31	0,00	-0,33	-0,19	-0,46	0,10	0,11	-0,71	1,00	0,70	1,00	
IP	-0,21	-0,17	0,05	-0,24	-0,08	-0,31	-0,03	0,08	-0,57	0,98	0,57	0,98	1

**The impact of morphological indices on some swimming parameters
(Case of Algerian Sprinters swimmers)**

Table 2 : THE OVERALL RESULTS OF THE EXPERIMENTATION

Table 2 : The values of the studied, anthropometric and swimming indices of

AGE	WEIGHT	HEIGHT	FOOT LENGTH	BODY SURFACE	BMI	FAT%	MUS %	SWIMMING SPEED	FREQ	PERF	AMPLITUDE	IP
23	84,2	1,87	28	2,11	24,08	7,90	63,60	2,11	42	23,68	0,84	1,77
16	71	1,82	26	1,93	21,43	14,14	68,27	2,02	41	24,81	0,82	1,65
24	81,2	1,9	28	2,11	22,49	9,66	60,90	2,06	37	24,24	0,74	1,53
20	74	1,81	25,5	1,95	22,59	10,11	63,67	2,08	37	24,07	0,74	1,54
21	74,3	1,79	26	1,93	23,19	9,08	65,30	2,08	35	24,01	0,7	1,46
22	83	1,83	27,5	2,06	24,78	9,47	67,09	2,17	31	23,02	0,62	1,35
22	82,4	1,88	29	2,10	23,31	11,19	62,09	2,14	31	23,33	0,62	1,33

Algerian sprinters during a 50 m Crawl.

3.2 The correlation between the weight and the SW.Speed

Figure 1 : The correlation between the weight and the SW.Speed

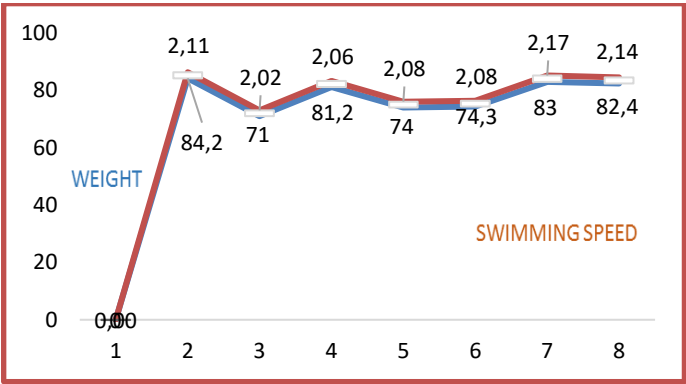
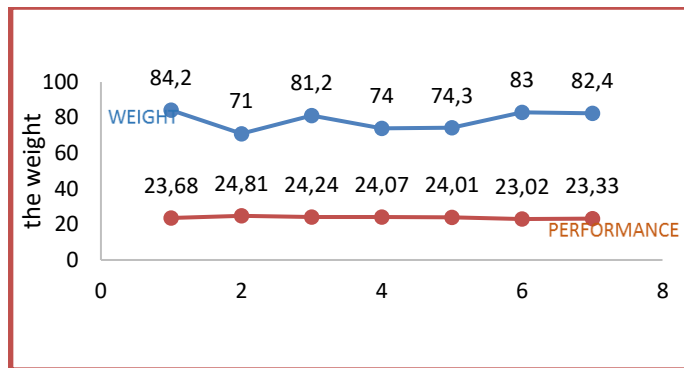


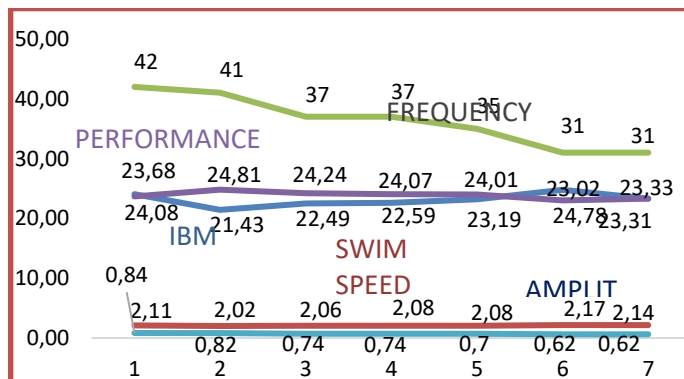
Figure 2: The Correlation Between Weight And Average Swimming Speed Of Sprinters



The weight has a positive influence on the Sw.Speed with a value of $r = 0.76$ and negatively on sports performance $r = 0.77$, where it is noted that the two correlations are highly significant. Figure 1 and 2.

3.2 The correlation between I.B.M and Swimming speed , swimming frequency, swimming amplitude and athletic performance of swimmers sprinters

Figure 3 : The correlation between I.B.M and Swimming speed , swimming frequency, swimming amplitude and athletic performance of swimmers sprinters



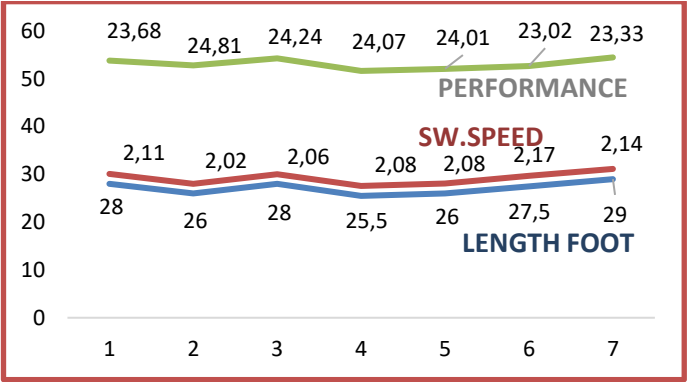
The "BMI" body mass index displays four correlations, two of which are highly significant. One is with Sw.Speed $r = 0.92$ and the other is with athletic performance $r = -0.92$. The remaining two results are medically and negatively

**The impact of morphological indices on some swimming parameters
(Case of Algerian Sprinters swimmers)**

correlated, one with swim frequency and the other with swim amplitude $r = -0.46$.
Figure 3

3.3 The Correlation Between Foot Length, Swimming speed , And Performance Of Swimmers Sprinters

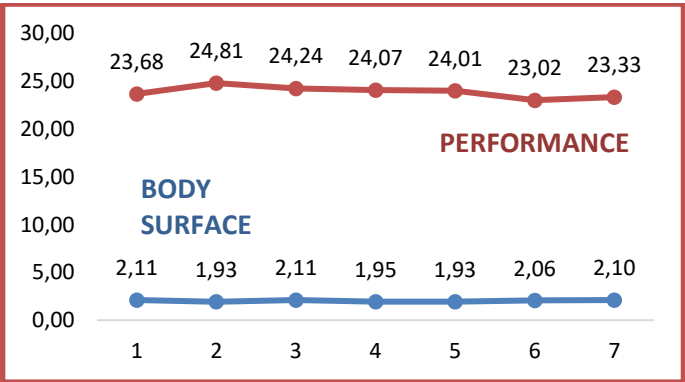
Figure 4: The Correlation Between Foot Length, Swimming speed , And Performance Of Swimmers Sprinters



Foot length has two correlations, one of which is positive with the Sw.Speed $r = 0.58$ and the other negative with sports performance $r = -0.58$. Figure 4

3.3 The Correlation Between Body Surface Area And Performance Of Swimmers Sprinters

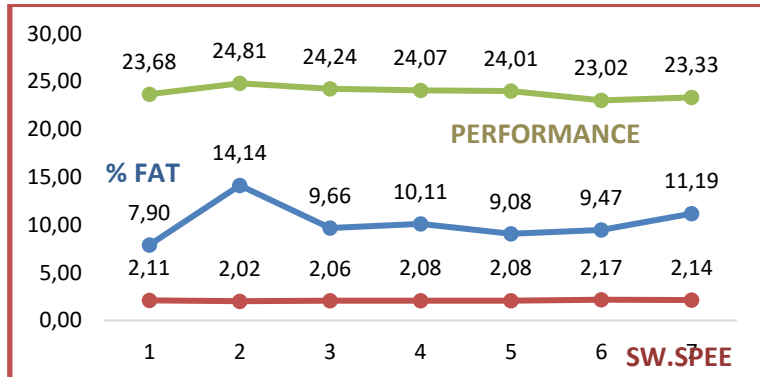
Figure 5: The Correlation Between Body Surface Area And Performance Of Swimmers Sprinters



Body surface area has a negative correlation on the sports results of swimmers or $r = -0.56$. Figure 5

3.3 The correlation between fat percentage, Swimming speed and athletic performance of swimmers sprinters

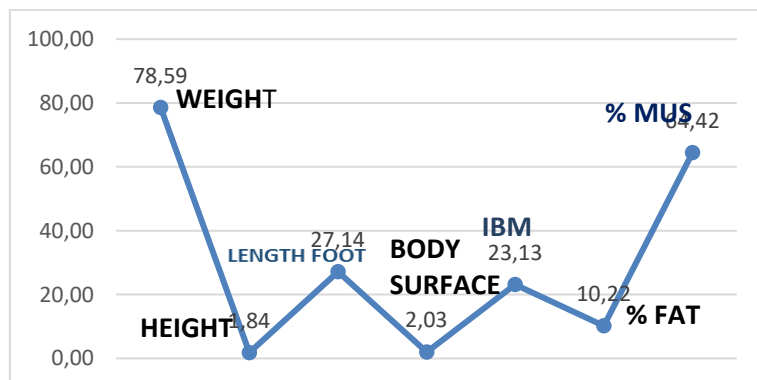
Figure 6: The correlation between fat percentage, Swimming speed and athletic performance of swimmers sprinters



Fat mass has a negative impact on average swimming speed $r = - 0.52$ and positively on athletic performance with $r = 0.54$. Figure 6

3.4 THE Morphological profile of Algerian sprinter swimmers 50 meter Crawl.

Figure 7 : Morphological profile of Algerian sprinter swimmers 50 meter Crawl.



The impact of morphological indices on some swimming parameters (Case of Algerian Sprinters swimmers)

At the end we offer you the Morphological profile resulting from this study and which is clearly represented in Graph 7 .

4. Discussion

The weight being given as an index most used for sportsmen to determine the physical or morphological state, and which could in these cases predict the state of sporting form, confirmed by a study where the weight is one of the parameters very determining in sports performance (Cazorla, Montpetit, Fouillot and Cervetti, 1985; Chatard, Padilla, Cazorla and Lacour, 1987; Pelayo, 1989). (Figure 1 AND 2 .

In this study two results stand out which are very significant. The first, the weight is correlated with the average swimming speed in the 50 meter race where the correlation reaches a value of $r = 0.76$. The second has an impact on sports results where the best sports performances are achieved by swimmers whose weight exceeds 82 KG. This index is very significant where the correlation value is $r = -0.77$

BMI has a positive influence on the values of the average swimming speed of the sprinter swimmers with a very significant correlation impact, its value is $r = 0.92$. The BMI also influences the sports results of swimmers sprinters by the same value as the previous one but this time the correlation is negative $r = -0.92$. In other words, the greater the value of the BMI, the better the sports results (Decrease in times realized). According to several authors (Cazorla et al. 1985; Chatard et al. 1987; Pelayo, 1989), who argue that the stature of swimmers represents one of the most determining factors of swimming performance whereas in our results it is not gave no correlation result for this parameter (height), and unlike this parameter has significance when is associated with weight (Figure 3).

The most highly significant correlations in this study are two morphological parameters having a very sharp impact on our studied swimming index . These morphological parameters are weight and Body Mass Index (BMI). Statistical analysis confirms that our swimmers are characterized by weight values ranging from 82 to 84 Kg and with body mass indices that vary between 23.31 and 24.78. These two factors contribute in modifying the athletic results of our swimmers sprinters. This study will allow our coaches to extract a morphological profile of Algerian sprinters who have oriented themselves towards this racing specialty (50 meter crawl sprint). By demonstrating these results the homogeneity of our swimmers on weight and BMI parameters is much more decisive. (Figure 7).

5. Conclusion

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**The impact of morphological indices on some swimming parameters
(Case of Algerian Sprinters swimmers)**

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