

Physical Development of 11–12 Year-Old Girls Involved in Swimming and Diving

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Abstract—Features of physical development, largely determine the possibility of achieving high sports results in various sports. The study of morphofunctional indicators of athletes of different specializations has long been one of the important areas of sports science. It is known that athletes of different specializations are distinguished by characteristic morphofunctional signs and types of biological development that determine the growth rate of sports achievements. However, a comparison of the physique and physical development of girls involved in swimming and diving has not previously been carried out. The article presents a comparison of morphofunctional indicators of girls of 11-12 years of age, engaged in swimming and diving, pupils of the SSR of Moscow. Research methods: anthropometry, fractionation of body weight, methods of statistical data processing. The differences in physical development and the composition of the body weight of girls jumpers in the water and swim 11-12 years. So girls swimmers have higher rates of length and body weight, as well as chest girth, and jumpers in the water – the advantage of active body weight. The study revealed differences in the physical development of girls involved in swimming and diving from the age of 11. These differences seem to be due to the influence of sports selection, on the one hand, and on the other –sports training.

Keywords—swimmers; water jumpers; physical development; body proportions; body mass composition.

I. INTRODUCTION

The study of morphofunctional indicators of athletes of different specializations has long been one of the important areas of sports science. A lot of famous scientists made research works in constitutional peculiarities of athletes [1,2]. The study of morphofunctional indicators helps to solve the major problems of modern sport, that is: - selection and defining physical fitness in various sports[2, 3, 4,]; –defining of rate of growth and short time perspective during separate age periods [5]; orientation of different regions inhabitants in sport specialization and so on.

In the last few years a big material concerning the dynamics of physical and biological development of

sportsmen has been kept and correlation with rates of growth of sports achievements has been shown [4,5,6,7]. However, a comparison of the physique and physical development of girls involved in swimming and diving has not previously been carried out.

II. RESEARCH METHODOLOGY

The aim is to define the peculiarities of physique and development rates of girls swimmers and jumpers in the water aged 11-12 years old.

Tasks of the research:

1. Study the peculiar features of physical development of girls aged 11-12 years old, involved in swimming and diving.
2. Compare the indicators of composition of body weight of girls aged 11-12 years old, involved in swimming and diving.
3. Reveal the main differences in physique of girls aged 11-12 years old, involved in swimming and diving.

Physical development and physique features of girls aged 11-12 years old research was made by anthropometry method. The results were handled by the method of mathematical statistics. Average indicators were figured out – \bar{X} , standard variations - σ and certainty of differences of average indicators of student's t-test. The Research was made on the basis of SSOR of Moscow in 2016-2017. 18 girls aged 11-12 years old, involved in swimming and diving took part in the research in each of the age group.

III. RESULTS

Comparative study of the main indicators of physical development (Table 1) showed that according to the length of body girls swimmers aged 11-12 years old excel their peers jumpers to the water. In the age of 11 the difference is 6.4cm, while in the age of 12 – 17cm. Comparison of annual growth of body length in the period between 11 and 12

years old let to set higher indicators of female swimmers (13,8 cm) comparing with jumpers to water (3.3 cm).

TABLE I. THE MAIN INDICATORS OF PHYSICAL DEVELOPMENTS OF GIRLS AGED 11-12 YEARS OLD, INVOLVED INTO SWIMMING AND DIVING

Indicators	Age	Swimming	Diving	P
		X ± σ	X ± σ	
Body length (cm)	11	144,9 ± 1,6	138,5 ± 4,9	<0,05
	12	158,8 ± 4,8	141,8 ± 4,7	<0,01
Body weight (kg)	11	34,6 ± 0,7	30,8 ± 3,3	<0,05
	12	46,2 ± 1,3	32,3 ± 8,4	<0,01
Chest girth (cm)	11	71,3 ± 1,2	67,1 ± 3,7	<0,05
	12	82,1 ± 4,8	69,9 ± 3,1	<0,01
Brock Index (Body length – body weight 100)	11	10,3	7,8	
	12	12,6	9,5	

Comparison of indicators of body weight in girls aged 11-12 years old, involved in swimming and diving shows that in the age of 11 girls swimmers significantly surpass the jumpers into water to 3,8 kg, while in the age of 12 the spread is more essential and equals 13,9 kg. Thus annual growths are also changed and equals 11.6 kg at girls - swimmers and 1.5 kg at jumpers into water.

According to the chest girth girls swimmers also surpass jumpers into water. So at the age of 11 the spread equals 4.2 cm, and at the age of 12 – 12.2 cm. This differences statistically true and are induced by the specific of the kind of sport. For the swimmers chest girths influence for the indicator of vital lung capacity (VLC), that is closely related to sport results in swimming. The annual growth of girls - swimmers from 11 to 12 years old equals 11.6 cm, jumpers into water only 1.5 cm.

According to Brock index girls - swimmers also surpass the girls jumpers into water. So at the age of 11 this indicator of girls swimmers equals 10.3 while jumpers into water 7.8 By the age of 12 Brock index of the girls under test of both specialties increases and equals to 12.6 for girls swimmers and 9.5 for jumpers into water females (table 1). This reflects the specific character of swimming as a kind of sport: the higher the Brock index, the better the hydro dynamic qualities of the swimmer. For the jumpers into water given indicator doesn't have the significant meaning.

Higher annual growths of the researched indicators of physical development may witness of the earlier entering of the girls- swimmers into adolescence period of development.

TABLE II. BODY PROPORTIONS OF GIRLS AGED 11-12, INVOLVED IN SWIMMING AND DIVING (%)

Indicators	Age	Girls swimmers	Girls jumpers into the water	P
		X ± σ	X ± σ	
Body weight / Body length	11	23,9± 1,3	22,2± 0,3	< 0,05
	12	29,1± 1,2	22,7±0,3	< 0,01
Chest girth/ Body length	11	49,2±0,5	48,4±0,4	< 0,05
	12	51,7±1,5	49,3±0,3	< 0,05
Shoulders width/body length	11	22,6±1,4	20,4±0,3	< 0,01
	12	22,3±1,3	22,1 ± 0,2	>0,05
Arm length/Body length	11	45,5±1,5	43,3± 0,1	< 0,05
	12	45,1±1,7	43,8±0,2	< 0,05
Leg length /body length	11	56,4±1,4	55,2± 0,3	< 0,05
	12	55,8±1,6	54,9±0,3	> 0,05

The assessment of body proportions was held by the calculation of the ratio of the body weight indicators, chest girth, shoulders width, arm and leg length to the body length in %.

According to the body proportions girls swimmers considerably differ from the jumpers .So the ratio of body weight to body length of girls swimmers increases from the age of 11 to 12 more significantly, rather than jumpers into water. Also high growth are marked at swimmers according to indicators characterizing chest girth ratio to the body length.

Shoulders width ratio to the body length of 11 year old girls swimmers considerably higher than those of jumpers into water. However by the age of 12 the differences become statistically not true.

Study of the body proportions of girls aged 11-12 years old testify that girls swimmers have longer limbs as opposed to the jumpers into water. Ratio of arms' length to the body length at the age of 11 equals 45.5% for girls swimmers and 43.3% for the girls jumpers into the water. At the age of 12 45.1 and 43.8% respectively. The same tendency is kept in the ratio of leg length to the body length (table 2).

TABLE III. COMPARATIVE DATA OF THE COMPOSITION OF THE BODY WEIGHT (%) OF THE GIRLS AGED 11-12, INVOLVED INTO SWIMMING AND DIVING.

Indicators	Age	Girls Swimmers	Girls Divers	P
		X ± σ	X ± σ	
Muscle mass %	11	48,0 ± 3,7	46,4 ± 3,0	>0,05
	12	49,9 ± 3,5	50,3 ± 6,6	>0,05
Bone mass%	11	17,8 ± 1,6	20,9± 1,1	<0,05
	12	17,9 ± 1,6	21,2 ± 3,6	<0,05
Fat mass %	11	18,0 ± 5,6	5,9 ± 1,7	< 0,05
	12	21,8 ± 6,0	6,2 ± 2,1	< 0,05
Active body weight%	11	65,8 ± 2,7	67,3 ± 1,5	< 0,05
	12	67,8 ± 4,2	71,5 ± 1,8	< 0,05

The analysis of the components of the body weight of groups under test showed that the muscular tissues of

jumpers into the water surpass the swimmers already at the age of 12 although at the age of 11 these indicators were lower. However the differences between them are not true.

The comparison of indicators of bone mass also witnesses about heavier bones of jumpers into the water. However according to the bone mass of swimmers and jumpers into water at the age of 11 equals 3.1 and at the age of 12 -3.3% moreover truthfulness of the differences gets significant rates. This is confirmed by the active body weight data, which is truthfully higher at jumpers into the water in tested groups. (table 3)

As far as fat component concerned, it is expressed at swimmers higher rather than at jumpers into water. So at the age of 11 the difference is 121%, at the age of 12 – 12.6%. It is connected with the necessity of swimmers to spend long time in the water during the training activities, stimulate the organism to forming the barrier against hypothermia (overcooling), it also increases swimming capacity of the body.

IV. CONCLUSION

Thus, the study revealed differences in the physical development of girls involved in swimming and diving from the age of 11. These difference in our opinion are due to the sports selection and the influence of sports training. Moreover, by the age of 12 the difference according to the most indicators becomes more vivid.

It was revealed that girls - swimmers significantly surpass their peers jumpers into the water according to the indicators of body length and weight, chest girth, Brock index. Characteristic feature for the swimmers is more strongly marked increase of annual growths studied indicators in the period from 11 to 12 years old, that is obviously connected with their earlier entering the adolescence. It is confirmed by set differences in body proportions of girls - swimmers and jumpers into water.

Mass composition of athletes groups under test characterize jumpers into water as athletically built ones, and higher indicators of active body weight (bone + muscle component) represent this, in comparison to the girls swimmers, who surpass them in fat mass. Revealing the differences between the girls, specializing in swimming and diving represent the availability of special features of structure of a body of athletes which should be taken into consideration while the process of sports selection.

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