

DIFFERENCES IN OLDER PIONEER GROUP SWIMMERS MOTOR SKILLS AND MORPHOLOGICAL CHARACTERISTICS IN RELATION TO GENDER

(Preliminary communication)

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Abstract

The aim of this paper is to determine the existence of any differences and their nature in the researched anthropological dimensions. The research sample comprises swimmers aged 13 ± 6 months. On the basis of the selected statistical-mathematical model and the aim of the research, it was decided that the sample would consist of 60 swimmers, 30 boys and 30 girls. In order to evaluate their motor skills, five motor tests were taken from the EUROFIT battery. To evaluate the morphological characteristics, following variables were measured: body height (ATV) – to evaluate the longitudinal dimensionality of the skeleton, body mass (ATT) – to evaluate body volume and the body mass index (BMI). To evaluate motor skills, the variables of the flamingo test of balance (FLB), hand tapping (TLP), seated hyperextensions (SAR), the depth jump (SBJ), and hanging pull-ups were used (BAH). To determine the differences between the groups, the t-test for independent samples was used. On the basis of the obtained results it was determined that in the category of the senior pioneers there was no statistically significant difference in the tested morphological characteristics between the boys and girls, primarily in terms of body height and body mass. It was also determined that there was a significant difference in certain motor skills, especially at the level of agility in favour of the girls, and muscle strength and force in favor of the boys.

Keywords: *girls, boys, body height, body height, body mass index, EUROFIT battery, flamingo test of balance, hand tapping, seated hyperextensions, the depth jump, hanging pull-ups, the t-test for independent samples,*

INTRODUCTION

Training process represents an exceptionally complex task whose final aim is to raise the anthropological status of the individual to a qualitatively higher level, aiming at improving sports results. The rationalization of the training process is one of the most important conditions for the effective work of experts. This rationalization is especially important when working in economically weaker environments, which automatically means worse conditions for the realization of the training tasks. Quite often, coaches striving to use more effectively available time slots for pool, unfortunately combine what is essentially quite opposite, disregarding the differences in age and gender. That is why the coach has to have excellent knowledge of motor skills and morphological characteristics of his students, so as to observe the existing differences, provide group homogeneity and

suitable group working conditions:

Numerous problems are related to motor skills and morphological characteristics, their structure and development. Motor skills and morphological characteristics, as man's psychosomatic features are not independent, and they exhibit complex interaction with other skills and characteristics.

Considering that these two components of the anthropological status of man develop from birth, they change during youth and well into adulthood. Their development, especially in youth, is not always the same in boys and girls. For each motor skill there is a certain period of sensibility when the greatest development is achieved. Individual differences in the dynamics of growth and development are a significant source of variability of the form, function and the ability of the human body.

Numerous studies conducted locally and abroad, on the influence of physical exercise on the development of motor skills and morphological characteristics of students of both genders indicate that proper organization of work and adequate dosing of the intensity and load observing individual characteristics could influence the development of the psychosomatic status segments. To realize this, it is necessary to know the influence of physical exercise, development of current dimensions and, on the basis of the testing data, make timely professional interventions so as to manage the teaching process (Morrow, Jackson, Disch, & Mood, 2005).

From the onset of puberty human body develops more quickly, and that period represents the second phase of quickened development, or the juvenile phase of development. It is characterized by the growth of height and muscle mass. From puberty onwards the differences in motor skills between boys and girls become increasingly greater, males achieve better results on the tasks which require force, strength, speed, endurance, and females on tasks of agility (Stanković, 2001; Kukolj, 2006). On the other hand, in this period of growth and development, girls achieve higher values for the motor skill of flexibility (Katić, Bala, & Barović, 2012).

The period of puberty brings differences in morphological characteristics. Considering the fact that girls enter puberty somewhat earlier than boys, and that biological maturation varies from person to person, the age 12-14, boys and girls do not differ significantly in body height, body weight and body mass index (BMI) (Tanner, 1981).

The aim of this paper is to determine whether there are any differences in the morphological or motor skills between senior pioneers in terms of gender. It is assumed that in terms of morphological parameters there will be no significant differences between the boys and girls.

METHODS

The sample of subjects

On the basis of the selected statistical-mathematical model and the aims of the research it was determined that the sample would consist of 60 swimmers aged 13 ± 6 months, 30 boys and 30 girls. The **subjects were** senior pioneers.

The sample of variables

For the evaluation of motor skills, five variables were selected, which reliably predict the level of motor skills of swimmers of both genders. The tests were taken from the EUROFIT battery of tests.

The measured variables included:

- The Flamingo test of balance (FLB) - for the evaluation of general balance,
- Hand tapping (PLT) - for the evaluation of movement speed frequency,
- The seated hyperextension (SAR) - for the evaluation of agility in the hip joint,
- The standing depth jump (SBJ) - for the evaluation of speed strength of the leg extensors,

- The hanging pull-up (BAH) - for the evaluation of the endurance in the muscle force of the arms and shoulder belt.

In order to evaluate the morphological characteristics, following variables were measured: body height (ATV) –for the evaluation of longitudinal dimensionality of the skeleton, body mass (ATT) – for the evaluation of body volume and the body mass index (BMI).

Statistical analyses

For each variable of these two subsamples basic descriptive indicators were calculated: the means (Mean), standard deviation (SD), the variation coefficient (Cv%), and the minimum (Min) and maximum results (Max).

The statistical significance of the differences in the means of the appropriate variables between the compared samples was evaluated using the t-test for independent samples. All the statistical analyses were carried out on a Pentium IV computer using the SPSS 19 program.

RESULTS AND DISCUSSION

Table 1 shows the basic descriptive indicators of the morphological characteristics of the boys. When compared with the results from similar studies (Gajević, 2009), we can determine that the boys are average in terms of body height (ATV) and body mass (ATT). Based on the results of the body mass index results (BMI), boys are also average (Cole, Bellizzi, Flegal, & Dietz, 2000). Based on the variation coefficients we can conclude that the studied group is very homogenous regarding all the parameters of the morphological characteristics. It is assumed that homogeneity increased due to swimmer selection.

Table 2 shows basic descriptive indicators of the morphological characteristics of the girls. Based on the

Table 1. The descriptive indicators of the morphological characteristics of the boys

Statistic	Variables		
	ATV (cm)	ATT (kg)	BMI (kg/m ²)
Mean	165.1	53.7	19.7
SD	6.7	3.9	1.4
CV%	4.1	7.3	7.2
Min	151.2	45.1	16.4
Max	180.2	61.6	22.6

Table 2. The descriptive indicators of the morphological characteristics of the girls

Statistic	Variables		
	ATV (cm)	ATT (kg)	BMI (kg/m ²)
Mean	162.7	52.8	19.9
SD	5.1	8.3	2.8
CV%	3.1	15.8	14.3
Min	151.7	41.1	15.3
Max	174.6	79.3	28.4

obtained values, it can be concluded that in terms of body mass, body height, and the body mass index, girls are average. The homogeneity of the results is very high for the body height variable (ATV), while it is somewhat smaller for the body mass variable (ATT). These results were to extent expected, since at the studied age most girls are already in puberty.

Based on the results shown in Chart 1, we can conclude that boys scored somewhat higher values for body height and body mass, while girls scored somewhat higher values of BMI. However, there is no statistically significant difference in any of the parameters of the

morphological characteristics between the senior pioneers in terms of gender. These results confirm the results of similar studies (Prskalo, Nedić, Sporiš, Badrić, & Milanović, 2011).

Table 3 shows the basic descriptive indicators of the motor skills of the boys. When compared with the results of similar studies (Gajević, 2009), we can conclude that the studied group had higher values for the variables of the flamingo test of balance (FLB), seated hyperextensions (SAR), the depth jump (SBJ) and hanging pull-ups (BAH) than their peers. Only for the variable of hand tapping (PLT) did they score

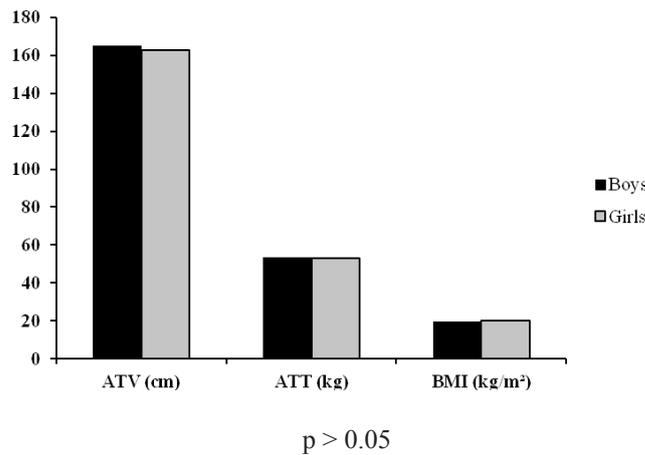


Chart 1: The differences in the morphological characteristics between the boys and girls

Table 3. The basic descriptive indicators of the motor skills of the boys

Statistic	Variables				
	FLB (n/s)	PLT (s)	SAR (cm)	SBJ (cm)	BAH (s)
Mean	13.1	14.7	21.1	179.8	28.1
SD	2.6	14.9	3.5	24.2	24.1
CV%	20.01	10.1	16.9	13.5	8.5
Min	5.1	10.2	15	100	3.2
Max	18.5	17.3	28	213	89

somewhat lower results. These results were—to some extent expected, since the studied group actively took part in swimming, and was assumed to have a greater level of motor skills than the average 12-14 children. On the basis of the correlation coefficient it could be determined that the smallest level of homogeneity was obtained for the variable the flamingo test of balance (FLB), while the greatest homogeneity was obtained for the variable the hanging pull-up (BAH).

Based on the results shown in Table 4, we can conclude that the studied group showed significantly higher values for the flamingo test of balance (FLB), seated hyperextensions (SAR), and hanging pull-ups

(BAH) than their peers. However, for the hand tapping variable (PLT) and the depth jump worse results were obtained for the group than for the average population of girls of their age. The greatest homogeneity of the results was obtained for the depth jump (SBJ), and the smallest for the hanging pull-up variable (BAH).

In Chart 2 we can see the results for the motor skills of the boys and girls. For the flamingo test of balance (FLB) variable the girls achieved somewhat greater results than the boys, but no statistically significant difference was determined. In this period of growth the level of balance varies, due to sudden changes in the parameters of morphological characteristics. Some

Table 4. The basic descriptive indicators of the motor skills of the girls

Statistic	Variables				
	FLB (n/s)	PLT (s)	SAR (cm)	SBJ (cm)	BAH (s)
Mean	13.6	15.2	24.6	141.8	16.5
SD	3.1	3.2	6.1	26.1	6.2
CV%	23.2	21.4	24.4	18.4	54.3
Min	4.2	10.2	14	72	3.4
Max	19.8	23.5	36	186	22.3

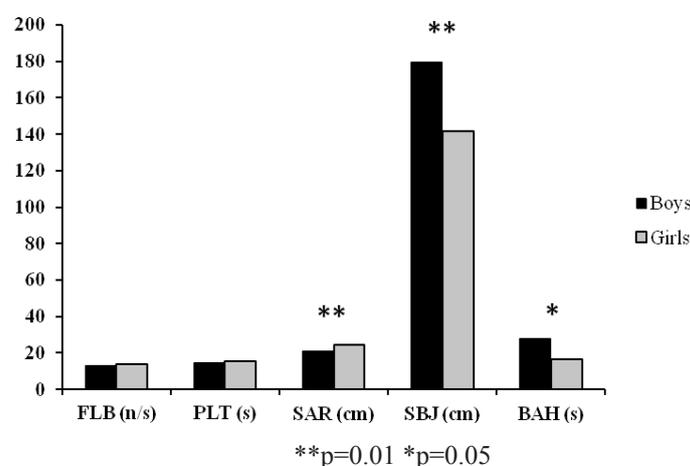


Chart 2. The differences in the motor skills between the boys and girls

studies indicate that boys are significantly better at balance (Kraljević, Gadžić, & Vučković, 2013), while some show that between the ages of 12-15 there is no difference between the boys and girls in terms of balance (Nolan, Grigorenko, & Thorstensson, 2005).

In the hand tapping (PLT) variable, the girls achieved somewhat better results, but no statistically significant difference was obtained between the boys and girls. The speed of movement frequency, the ability which determines the frequency of movement in a unit of time, achieves its maximum development at the age of 15-16 for the boys, and 14-17 for the girls (Kukulj, 2006). It is assumed that this group of subjects is at approximately similar level of biological growth, and that is why no statistically significant differences were obtained, which certainly would be different for the older age groups.

Agility is a motor skill where the boys and girls differ in a significant manner. The obtained statistically significant difference at the $p=0.01$ level is in favor of the girls. This result was expected. Almost all the studies dealt with the differences in motor skills confirmed that girls manifest greater agility than boys (Prskalo et al., 2011; Katić et al., 2012; Katić, Pavić, & Čavala, 2013). Females are generally characterized by greater levels of agility. Agility is directly related to strength, since

the stronger the muscle, the smaller the mobility in the joint (Zaciorski, 1975). Considering the fact that boys, starting from puberty, manifest greater strength and force than girls, they have lower levels of agility in their joints.

In the depth jump variable (SBJ) and the hanging pull-up (BAH) the boys and girls differ significantly at the $p=0.01$ level of significance, in favor of the boys. These results were also expected. From puberty the boys differ significantly in muscle strength and force. Development of muscle mass is related to the development of the reproductive system, that is, the influence of hormones which stimulate sexual maturation - testosterone (Round, 1999; Rogol, Roemmich, & Clark, 2002). The connection between testosterone and muscle mass explains the differences which exist between individuals of different genders in muscle force, strength, speed and overall ability expressed through physical activities. Even though they both have a certain concentration of testosterone which circulates in the bloodstream at rest, in females it is 10-20 times smaller (Kreamer, Ratamess, & Komi 2003). The greater amount of this hormone in males, the greater muscle mass thus males display greater force and strength (Zaciorski, & Kreamer, 2006). Studies indicate that between male and female swimmers

in puberty there is a statistically significant difference in muscle force, that is, boys manifest a significantly greater force than girls (Barbosa et al., 2013). This study has confirmed these findings.

CONCLUSION

Swimming is one of those sports science has made a grand entrance in. It calls for joint effort of science and practice to realize serious competitive results. More or less, all relations and differences in age and gender are known, which theoretically means all the parameters necessary for the planning and programming of the training process are provided. Unfortunately, in practice, especially in economically less developed environments, the situation is slightly different. In a club where there is, for instance, only one coach, it is difficult to adhere to all the laws related to age and gender differences. However, if we cannot adhere to all the rules, we must try to, based on the existing work conditions and our knowledge of the differences between athletes, both in terms of age and gender, achieve the best possible group homogeneity, as a precondition of the successful realization of training tasks.

In this study data on the morphological characteristics and motor skills of the senior pioneers swimmers and the differences between them in terms of gender, were obtained. It was determined that at the age of 13, there is no statistically significant difference in certain morphological characteristics between boys and girls, and this primarily refers to body height, body mass and body mass index. It was also determined that there is a significant difference in certain motor skills, especially at the level of agility in favor of the girls, and muscle strength and force in favor of the boys. These results are in accordance with the existing research studies, and as it was indicated, they can be used by coaches when planning and programming the training process of the senior pioneer age swimmers.

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