Технології навчання фізичної культури

УДК 159.922.73:[796.011.3:797.212.7]– 053.5

CONSIDERATION OF THE SOMATOTYPE IN THE DEVELOPMENT OF PRIMARY TEACHING SWIMMING METHODS OF CHILDREN

Olga Obrazhey[1]

[1]Lesya Ukrainka Eastern European National University, Lutsk, Ukraine, obrik102119@ukr.net

https://doi.org/10.29038/2220-7481-2017-04-29-34

Abstract

The study reveals the issue of studying the physical development and a somatotype of a child to develop a methodology for initial swimming training in open water bodies. The following methods are used in the work: analysis and generalization of literary sources, medical-biological methods (anthropometric), pedagogical observation, methods of mathematical statistics with using «Excel 2000». The buoyancy of primary school children was diagnosed in real conditions of swimming training lessons with two tests: horizontal and vertical. The survey sample consisted of children aged 8–9, out of which there were 15 girls and 14 boys. They were at «Swimming school» in Kherson during June 2016. All children were able to swim. An individual assessment of the degree of anthropometric development indicators using centimetric tables revealed that children with an average level of physical development predominated in two sexually active age groups, but there was a significant percentage of children with a low level of physical development.

In the course of the study, it was discovered that boys and girls of hypersthenic somatotype had high level in two exercises; children of primary school age of normostenic and asthenic somatotype had less buoyancy. The analyzed values of the correlation coefficients indicated that there was an insignificant connection between height and buoyancy. The study observed the relationship between the indicators of body weight and the result of buoyancy test. The most significant relationship wass between the result of the chest volume and the result of the buoyancy tests.

Key words: swimming, buoyancy, physical development, somatotype, primary school age.

Ольга Ображей. Урахування соматотипу в розробці методики початкового навчання плавання дітей. У дослідженні розкрито питання врахування фізичного розвитку та соматотипу дитини для розробки методики початкового навчання плавання на відкритих водоймах. У роботі використано такі методи: аналіз й узагальнення літературних джерел, медико-біологічні методи (антропометричні), педагогічне спостереження, методи математичної статистики із застосуванням програми «Excel 2000». Плавучість дітей молодшого шкільного віку діагностували в реальних умовах проведення навчальних занять із плавання двома тестами – горизонтальним і вертикальним. Обстежуваний контингент склали 29 дітей віком 8–9 років, які перебували в «Школі плавання» м. Херсона у 2016 р. протягом червня місяця. Усі діти вміли плавати. Індивідуальна оцінка ступеня розвитку антропометричних показників із використанням центильних таблиць виявила, що у двох статевовікових групах переважають діти із середнім рівнем фізичного розвитку, але спостерігали наявність значного відсотка досліджуваних із низьким рівнем фізичного розвитку.

У ході дослідження виявили що високий рівень із двох вправ отримали хлопчики й дівчатка гіперстенічного соматотипу, діти молодшого шкільного віку з нормостенічним та астенічним соматотипом мають меншу плавучість. Проаналізовані значення коефіцієнтів кореляції свідчать про наявність незначного зв'язку між зростом і плавучістю. У ході дослідження помічено зв'язок між показниками ваги тіла та результатом тесту на плавучість. Найбільш істотні взаємозв'язки простежили між результатами об'єму грудної клітини та тестів на плавучість.

Ключові слова: плавання, плавучість, фізичний розвиток, соматотип, молодший шкільний вік.

Ольга Ображей. Учет соматотипа в разработке методики начального обучения плаванию детей. В исследовании раскрываются вопросы изучения физического развития и соматотипа ребенка для разработки методики начального обучения плаванию на открытых водоемах. В работе использованы такие методы, как

ISSN 2410-2156 (Online), ISSN 2220-7481 (Print)

кое

наблюдение, методы математической статистики с применением программы «Excel 2000». Плавучесть детей младшего школьного возраста диагностировалась в реальных условиях проведения учебных занятий по плаванию двумя тестами горизонтальным и вертикальным. Обследуемый контингент составили 29 детей в возрасте 8–9 лет, которые находились в «Школе плавания» в Херсоне в 2016 г. в течение июня месяца. Все дети умели плавать. Индивидуальная оценка степени развития антропометрических показателей с использованием центильних таблиц позволила определить, что в двух половозрастных группах преобладают дети со средним уровнем физического развития, но наблюдается наличие значительного процента детей с низким уровнем физического развития.

В ходе исследования обнаружено, что высокий уровень из двух упражнений получили мальчики и девочки гиперстенического соматотипе, дети младшего школьного возраста с нормостеническим и астеническим соматотипами имеют меньшую плавучесть. Проанализированы значения коэффициентов корреляции, свидетельствующих о наличии незначительной связи между ростом и плавучестью. В ходе исследования замечается связь между показателями веса тела и результатом теста на плавучесть. Наиболее существенные взаимосвязи между результатами объем грудной клетки и тестов на плавучесть.

Ключевые слова: плавание, плавучесть, физическое развитие, соматотип, младший школьный возраст.

Topicality. The education of a healthy generation with harmonious development of physical and spiritual qualities is one of the main tasks of modern society. Human health is the highest value in any society based on humanistic and democratic principles, the most important property of the state, it is an indisputable priority, a guarantee of vitality and progress of society [1; 2; 3]. Together the quantitative and qualitative display of physical development level, the relationship between the sizes and the intensity of their growth, like other somatometric features reflect the phase development and maturity level inherent in every stage of ontogenesis [1]. Physical development is one of the factors that determines the success of the development of motor activities in swimming [5]. Considering it as a morpho–functional state of a person, one should pay attention to the features that predominate in the pedagogical process of studying swimming. Anthropomorphological features of a human structure are an important precondition for effective mastering of swimming skills. However, data on the influence of anthropometric indicators on the ability of learning swimming is controversial. M. O. Bernstein points out that «... each body type, his muscles, and especially the structure and the degree of development of its brain levels are so diverse and unique that even when the skill is mastered in general, each student is very much attributed to the motor part of the skill to his personal characteristics». Therefore, the issue of studying the physical development and the somatotype of a child is still relevant to develop a methodology for initial swimming training in open water bodies [6].

The purpose of the study: to study the somatotype as a part of the methodology of primary teaching swimming.

Materials and methods of research: The survey sample consisted of 29 children aged 8–9, out of which there were 15 girls and 14 boys. They were at «Swimming school» in Kherson during June 2016. All children were able to swim.

The following methods are used in the work: analysis and generalization of literary sources, medical-biological methods (anthropometric), pedagogical observation, methods of mathematical statistics with using Excel 2000. Anthropometric measurements (body length, body weight, and chest perimeter) were performed to determine the level of physical development of primary school age children. The value of each obtained indicator was estimated by comparing the actual value of each three indicators of physical development with the norms of the relevant standard according to the assessment tables of the centimetric type [1; 4]. Based on the data, the level of physical development was stated. Children with body length, body weight and perimeter of the chest in the range lower than average, average and above average obtained the evaluation of «harmonious development». The second values were evaluated as disharmonious: low or high growth, deficiency or excess weight. Diagnosis of somatotype was carried out according to the method of M. V. Chernorutsky [1; 2; 4]. According to the index of physical development – the Pinyu index (PI), the children were divided into somatotypes: asthenic with PI> 30, hypersthenic with PI <PI and normosthenic type at 10 <PI <30. Statistical data processing and the estimation of the probability of differences between the indicators were performed using Student's t-test for unequal number of observations. The buoyancy of the primary school children was diagnosed with two tests: horizontal and vertical [5; 6]. The first is the ability to lie on the water «Zyrochka». We offered the child to perform the exercise: to take a deep breath, to put arms and legs apart, to lie on the water on the chest immersing the face in the water, to hold the breath, to lie on water to the teacher's commands (count up to 7–9). The low level was reached by the children that breathed in, tried to lie on the

water, but were afraid to get their feet off the bottom of the reservoir, to lower the whole face in the water. The children who breathed in, lay on the water, but fixed the pose «Zyrochka» for a short time (count up to 3–5) or did it wrong, got the average level.

The high level was received by children who breathed in, lay on the water, fixed the pose «Zyrochka» correctly for a long time (count up to 7–9). When performing the second test, the child on a full breath gradually plunged into the water vertically with the hands raised up. The high level of buoyancy was characterized by immersion, in which the elbow joints at its end point were at the surface of the water, the average level was characterized by immersion, in which the bristles were above the water, the children who received a low level were immersed completely on the bottom of the river. All tests were carried out with safety precautions and under the supervision of two swimming instructors, a lifeguard and a nurse.

The Results of the Study. Indicators of length and body weight, chest circumference and their ratio to a certain extent predetermine such hydrodynamic qualities as body balance in water, buoyancy, streamlining. In its turn, the body weight is in close correlation (r = 0,84) with hydrodynamic resistance [6]. Transverse body sizes also affect the value of water resistance. Scientists emphasize the importance of body building (somatotype) in the process of teaching swimming [5]. This is due to differences in the manifestation of motor skills of a person depending on the somatotype. It should be noted that the proportions and constitutional features of the body structure have an effect on the kinematics of human movements through the spatial organization of the bio chains in the process of mastering the motor skills (A. N. Laputin, V. L. Kashuba). In swimming we are dealing with the process of spatial organization of movements in an environment that is radically different in its properties from the everyday human environment. It also requires pedagogical attention in the teaching process [5; 6].

The analysis of the results of anthropometric measurements showed that the growth rates of the surveyed girls and boys of 9 years old did not differ significantly and were: the boys of 9 years old 132,5 ± 1,61 cm and the girls 133,3 ± 2,20 cm. Such results are estimated according to the table of standards as the average development level of primary school children. Indicators of body weight of 9 year –old boys are 29,5 ± 1,65 kg, and the girls of 9 years old are 29,5 ± 1,65 kg, which correspond to the average physical development level of primary school children. The measurement of body weight revealed that, both girls and boys indicators correspond to the average level of physical development of primary school children. The results of the measurements of the chest perimeter of 9 year-old children correspond to the average level of physical development of primary school children and were 66,4±1,20, and 9 year-old girls were 63,9±1,57 cm. Analysis of results of anthropometric measurements are shown in table 1.

Table 1

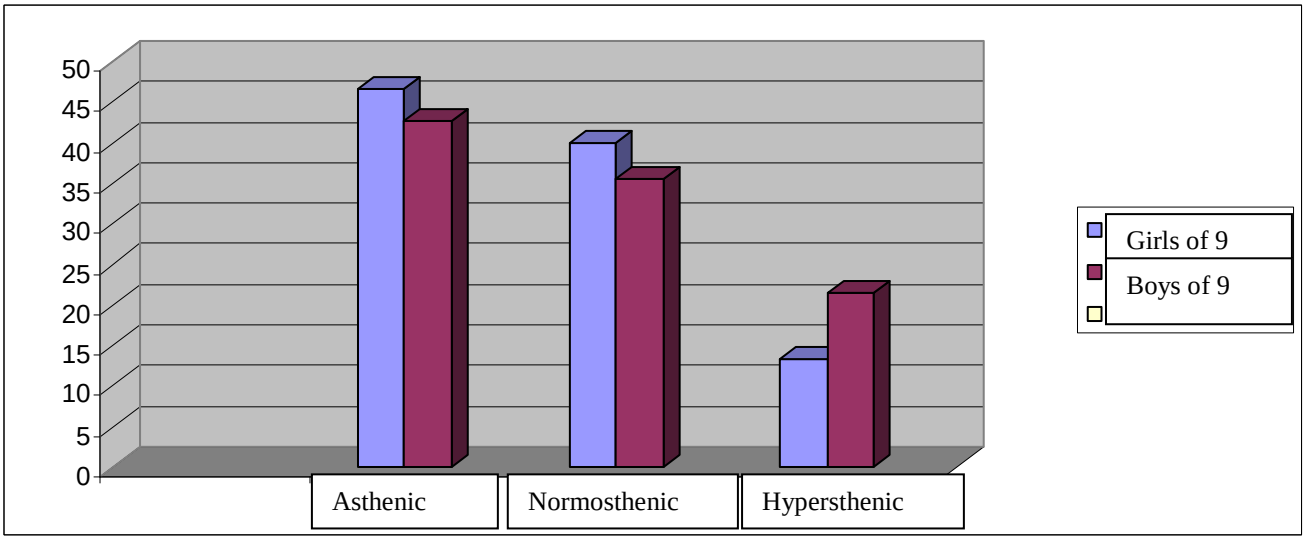
Somatometric Indicators of Primary School Children

Age	Sex	Body Weight	Length Body	Chest Circumference
8–9	B	29,5±1,65 (13,8)	133,3±2,20 (4,4)	66,4±1,20 (5,1)
	G	30,3±1,73 (5,3)	132,5±1,61 (1,2)	63,9±1,57 (2,3)

An individual assessment of the development degree of anthropometric indicators using centimetric tables revealed that the children with an average level of physical development predominated in two age groups, but there was a significant percentage of the children with a low level of physical development.

Thus, 86,6 % of the girls and 85,7 % of 9 year'old boys had harmonious physical development. 13,4 % of the girls and 14,2 % of 9-year-olds had disharmonious development.

The study of anthropometric profile of 9 year-old children allowed to identify three main somatotypes.



Pic. 1. *Percentage of 9 Year old Boys and Girls Somatotypes*

At the age of 9, 42,8 % of the boys had asthenic somatotype and 35,7 % had normosthenic, 21,5 % – hypersthenic. The girls of 9 years old had such somatotypes: 46 % asthenic, 40,5 % normostenic and 13,5 % hyperesthenic. At the age of 9 the growth rates prevail over body weight, so at this age the children of asthenic somatotype predominate. The results of the somatotype study of 9 year-old children are shown in pic. 1

To determine the buoyancy level of the primary school children, two common tests have been suggested [5]. The results of the tests are shown in table 2.

Table 2

The Result of the Buoyancy Tests in the Percentage of 9 Year-old Children

Nameof Buoyancy Tests	**Sex**	**Level, %**		
		High	Medium	Low
Horizontal	Boys n–14	28,5	50	21,5
	Girls n–15	26,7	53,3	20
Vertical	Boys n–14	28,5	57,2	14,2
	Girls n–15	26,6	46,8	26,6

A high level of two exercises had boys and girls of the hyperesthenic somatotype as found in the study. The results of buoyancy tests in the percentage ratio of somatotypes of 9 year–old children are given in table 3 and table 4.

Table 3

Test Result (Vertical) of Buoyancy in the Percentage of Somatotypes of 9 Year-Old Children

Name of the Somotype	**Girls**			**Boys**		
	High Level	**Medium Level**	**Low Level**	**High Level**	**Medium Level**	**Low Level**
Asthenic	28,5	42,8	28,5	16,6	66,6	16,6
Normosthenic	16,6	50	33,3	20	60	20
Hyperesthenic	50	50	0	75	25	0

The study found out that the children of primary school age with normosthenic and asthenic somatotype had less buoyancy. The highest percentage of the children who received the average level was one with asthenic somatotype (66,6 % of the boys). The highest percentage of the children who received a low level was the children with normosthenic somatotype (33,3 % of the girls).

Table 4

Test Result (Horizontal) of Buoyancy in the Percentage of Somatotypes of 9 Year-Old Children

Name of the somotype	Girls			Boys		
	High level	Medium level	Low level	High level	Medium level	Low level
Asthenic	14,3	57,2	28,5	16,6	50	33,4
Normosthenic	33,3	50	16,7	20	60	20
Hyperesthenic	50	50	–	75	25	–

The study allowed us to determine whether there is a correlation between growth rates, indicators of body weight, chest circumference and the results of buoyancy tests for the children of 8–9 years old.

Analyzing the values of correlation coefficients, it can be seen the slight connection between growth and buoyancy. Thus, the correlative connections are revealed between the growth and the result of the buoyancy tests (r = 0,6). There was also a link between the body weight and the result of the buoyancy test. The relationship between these indicators is (r = 0,7), which also indicates the average level of correlation. The most significant interconnections were traced between the result of the chest volume and the result of the buoyancy test. Their relationship is (r = 0,8), that indicates a high level.

The study clarified and confirmed that the children of primary school age with normosthenic and asthenic somatotype have less buoyancy. This can be explained by the fact that in a proportional way, muscle and bone mass prevail over fat mass. Muscles and bones have more buoyancy than water (i.e. heavier than water). It is difficult for them to stay afloat without moving, but they can easily develop speed and move in the water. It is also easy for them to maintain a balance in water. Swimming lessons of this type are most suitable in deep water [2].

It is found out that somatotype should be taken into account while developing water exercises. It is necessary to apply different positions of the body in order to allow children feel comfortable while exercising. The exercises, that require maintaining the horizontal position of the lower part of the body, will be inconvenient to perform for people with normosthenic type of body. They will have to make more efforts to keep the legs afloat. It is recommended to offer them the exercises that require a vertical position of the body. Horizontal position in the water is more natural for hypersthenetic somatotype. Lessons in a vertical position are less natural, when exercising they need to strain the abdominal muscles more strongly.

It is found out if fat accumulation is mainly found in the lower part of the body, the legs and hips become more buoyant. Thus, these children are easily kept on the water in a horizontal position. When fat accumulation is in the upper part of the body, the torso area becomes more buoyant, so it's easier for such children to stay in the water in a vertical position. The best buoyancy for the children of hypersthenetic somatotype leads to a problem of balance or maintaining a fixed position in the water. Therefore, the exercises that cause the perturbation of the wave, need to be transferred to «shallow water». It should be remembered that when exercising on «shallow water» a big burden will affect the joints. This requires adjustments to the training process.

Therefore, it is necessary to offer different positions that are appropriate for each type of buoyancy [2; 5; 6].

Conclusions and prospects for further research: An individual assessment of the development degree of anthropometric indicators using centimetric tables revealed that children with an average level of physical development predominate in two age groups, but there was a significant percentage of children with a low level of physical development.

The analyzed values of the correlation coefficients indicate that there is a slight correlation between growth and buoyancy. In the course of the study, there was a correlation between body weight and the result of a buoyancy test. The most significant interconnections were traced between the result of the chest volume and the results of buoyancy tests. Due to the study a high level of two exercises had the boys and girls of the hyperesthenic somatotype; the children of primary school age with normosthenic and asthenic somatotype had less buoyancy.

The prospect of further research is seen in the development of a method of accelerated swimming training for children in open water reservoirs based on the somatotype.

Sources and Literature

1. Бондаренко Г. О., Куц С. О. Анатомія і фізіологія людини: навч. посіб. для студентів вищ. мед. навч. закл. I–II рівнів акредитації/ред. П. І. Сидоренко; Кіровоградський базовий медичний коледж ім. Є. Й. Мухіна. Кіровоград: [б. в.], 2002. 248 с.

2. Єдинак Г. А., Зубаль М. В., Мисів В. М. Соматотипи і розвиток фізичних якостей дітей: монографія/Кам'янець-Подільський нац. ун-т ім. Івана Огієнка. Кам'янець-Подільський: Оіюм, 2011. 279 с.: рис., табл.
3. Завгородня Р. В Особливості фізичного розвитку дітей молодшого шкільного віку. МДПУ, 2010. 30 с.
4. Калиниченко І. О. Оцінка здоров'я та фізичного стану дітей молодшого шкільного віку. *Фізичне виховання, спорт і культура здоров'я у сучасному суспільстві*. 2008. Т. 2. С. 128–131.
5. Криводуд Т. Є. Навчання плаванню дітей дошкільного та молодшого шкільного віку: навч.-метод. посіб. для студентів пед. навч. закл./Т. Є. Криводуд [и др.]; Сумський держ. пед. ун-т ім. А. С. Макаренка. Суми: СумДПУ ім. А. С. Макаренка, 2003. 64 с.:мал.
6. Сізова В. Ю. Формування рухових умінь студентів у процесі занять плаванням з використанням методу випереджувального навчання: автореф. дис. канд. пед. наук: 13.00.02/Нац. пед. ун-т ім. М. П. Драгоманова. Київ, 2016. 18 с.

References

1. Bondarenko, H. O. & Kuts S. O. (2002). Anatomiia i fiziolohiia liudyny [Tekst]: navch. posibnyk dlia stud. vyshch. med. navch. zakladiv I-II rivniv akredytatsii [Anatomy and human physiology]. Kirovohradskyi bazovyi medychnyi koledzh im. Ye. I. Mukhina. Kirovohrad : [b.v.],248.
2. Yedynak, H. A., Zubal, M. V. & Mysiv, V. M. (2011). Somatotypy i rozvytok fizychnykh yakostei ditei [Tekst]: monohrafiia [Somatotype and physical development of children]. Kamianets-Podil. nats. un-t im. Ivana Ohiienka. Kamianets-Podilskyi : Oiium, 279.
3. Zavhorodnia, R. V. (2010). Osoblyvosti fizychnoho rozvytku ditei molodshoho shkilnoho viku. [Tekst] [In peculiarities of children's physical development of primary school age]. MDPU, 30.
4. Kalynychenko, I. O. (2008). Otsinka zdorovia ta fizychnoho stanu ditei molodshoho shkilnoho viku [Assessment of the health and physical condition of children of primary school age]. Fizychne vykhovannia, sport i kultura zdorovia u suchasnomu suspilstvi, t. 2, 128–131
5. Kryvodud, T. Ye. (2003). Navchannia plavanniu ditei doshkilnoho ta molodshoho shkilnoho viku [Tekst] : navch.-metod. posibnyk dlia stud. ped. navch. zakladiv [Swimming lessons for children of preschool and younger school age]. Sumskyi derzh. pedahohichnyi un-t im. A. S. Makarenka. Sumy: SumDPU im. A. S. Makarenka, 64.
6. Sizova, V. Yu. (2016). Formuvannia rukhovykh umin studentiv u protsesi zaniat plavanniam z vykorystanniam metodu vyperedzhuvalnoho navchannia [Tekst] : avtoref. dys. kand. ped. nauk : 13.00.02 [Forming of motive abilities of students in the process of engaging in swimming with the use of method of passing ahead studies]. Nats. ped. un-t im. M. P. Drahomanova. Kyiv, 18.

Стаття надійшла до редакції 24.10.2017 р.