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SELECTION OF 7–10 YEARS OLD CHILDREN OF DIFFERENT TYPES OF CONSTITUTION IN SPORT SWIMMING, TAKING INTO ACCOUNT THEIR PSYCHOLOGICAL AND PHYSIOLOGICAL FEATURES

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Abstract

The article revealed the need to consider the psychophysiological parameters of the central nervous system of the children of schoolchildren in the selection and orientation of the sport swimming. The interrelation of features such as the schoolchild constitution and the activity of his central nervous system has been revealed. Presented conducted an extensive research of boys 7–10 years old and based on the analysis of selected types of the most successful, the algorithm is composed of sports selection procedure, revealing the specificity and individuality of each student, which increases the effectiveness of achieving high results in the future.

Key words: Somatotype, psychophysiological parameters of the central nervous system, school age, selection, sport swimming.

Володимир Давидов, Анна Манкевич, Ольга Морозова. Відбір для плавання дітей 7–10 років різних типів конституції з урахуванням психофізіологічних особливостей. У статті розкрито необхідність дослідження психофізіологічних параметрів діяльності центральної нервової системи школярів для відбору й орієнтації в спортивному плаванні. Виявлено взаємозв'язок особливостей типу конституції школяра та діяльності його центральної нервової системи. Проведено масштабне дослідження хлопчиків 7–10 років і на основі аналізу результатів виділено типи найбільш успішних, складено алгоритм процедури спортивного відбору, що виявляє специфіку й індивідуальність кожного школяра та підвищує ефективність досягнення високих спортивних результатів у майбутньому.

Ключові слова: тип конституції, психофізіологічні параметри діяльності центральної нервової системи, шкільний вік, відбір, спортивне плавання.

Владимир Давыдов, Анна Манкевич, Ольга Морозова. Отбор для плавания детей 7–10 лет разных типов конституции с учетом психофизиологических особенностей. В статье раскрывается необходимость исследования психофизиологических параметров деятельности центральной нервной системы школьников для отбора и ориентации в спортивное плавание. Выявлена взаимосвязь особенностей типа конституции школьника и деятельности его центральной нервной системы. Проводится обширное исследование мальчиков 7–10 лет и на основе анализа результатов выделяются типы наиболее успешных, составлен алгоритм процедуры спортивного отбора, выявляющий специфику и индивидуальность каждого школьника, что повышает эффективность достижения высоких спортивных результатов в будущем.

Ключевые слова: тип конституции, психофизиологические параметры деятельности центральной нервной системы, школьный возраст, отбор, спортивное плавание.

Introduction. It is already known that to achieve high sports results a person needs to have not only a certain level of physical qualities development, but also an optimal organization of psycho physiological processes. The functional mobility (lability) of the central nervous system, the ability to concentrate, the severity of static and dynamic tremors, and the accuracy of movements are the indices of the functional activity of the central nervous system, which are especially important for those involved in sports. Obviously, in order to optimize sports selection, it is necessary to study psychological and physiological criteria for the development of the central nervous system of a person already at a primary school age.

At the same time, a close connection between the athletic performance of a person and the peculiarity of his or her physique has been proved. To improve the quality of selection, it seems rational to perform comprehensive testing of the psycho physiological parameters of the central nervous system, taking into consideration the type of constitution of people involved.

Methods of Research. 322 boys of 7–10 years were involved in study. Everyone was examined according to the method of Stefko-Ostrovsky, (1929) which helped to determine the type of constitution (asthenoid, thoracic, muscular, and digestive). Psycho physiological indicators of examinees were studied using the psycho-diagnostic complex «MIR». The time of a simple visual-motor response (RT, ms) was determined; characteristic of the ratio of the processes of excitation and inhibition of the central nervous system; Number of touches (NT, times), reflecting the static tremor of the muscles of the hand.

Also effective time was recorded (ET, sec.), characterizing the ability and concentration of attention. A critical flicker fusion frequency was established (CFFF, Hz), which makes possible to assess the lability of the visual analyzer; reaction of lead (RL, Ms.), characterizing the severity of the excitatory processes of the central nervous system. The number of hits and omissions was calculated, characterizing the accuracy of movements. To assess the age-specific features of psycho physiological functions, all children were divided into four age groups (1st-7 years, 2nd-8 years, 3rd-9 years, 4th-10 years).

Using the methods of mathematical statistics, the arithmetic middling (M) and the mean square deviation (x) were determined. The reliability of the differences was identified by Student's t-test.

Statement of the Material and Justification of the Results of the Research. The results of the study are shown in table 1.

Table 1

Psycho Physiological Indicators of 7–10 Years old Boys of Different Constitutional Types ($M \pm x$)

Indicators	Age, Years	n	Types of Constitutions	$M \pm x$	V	Min-max
1	2	3	4	5	6	7
Time of reaction	7	16	Asthenoid	$396,7 \pm 16,0$	4,0	243,0 – 506,0
		25	Thoracic	$398,4 \pm 18,0$	4,5	305,0 – 483,0
		13	Muscular	$536,0 \pm 14,0$	2,6	360,0 – 432,0
		13	Digestive	$399,7 \pm 18,6$	4,7	300,0 – 460,0
	8	14	Asthenoid	$396,0 \pm 15,9$	4,0	292,0–524,0
		24	Thoracic	$379,8 \pm 18,7$	4,9	293,0–461,0
		17	Muscular	$385,8 \pm 14,0$	3,8	274,0– 496,0
		13	Digestive	$365,0 \pm 18,3$	3,0	266,0–508,0
	9	13	Asthenoid	$352,3 \pm 16,5$	4,7	306,0–381,0
		25	Thoracic	$317,4 \pm 13,4$	4,2	244,0–443,0
		19	Muscular	$347,5 \pm 16,6$	4,8	324,0–371,0
		12	Digestive	$350,4 \pm 17,4$	5,0	321,0–366,0
	10	18	Asthenoid	$341,7 \pm 14,8$	4,3	215,0–340,0
		79	Thoracic	$315,0 \pm 14,9$	4,7	231,0–362,0
		19	Muscular	$296,0 \pm 17,0$	5,7	210,0–432,0
		12	Digestive	$334,1 \pm 19,4$	5,8	220,0–432,0

Table 1

1	2	3	4	5	6	7
Number of touches	7	16	Asthenoid	47,3 ± 6,0	12,7	26,0–79,0
		25	Thoracic	50,1 ± 6,4	12,8	12,0–94,0
		13		31,0 ± 5,6	18,1	15,0–70,0
		13	Muscular	61,0 ± 5,8	9,5	32,0–96,0
	8	14	Asthenoid	40,3 ± 4,6	11,4	17,0–55,0
		24	Thoracic	36,3 ± 4,5	12,4	15,0–66,0
		17		40,4 ± 5,3	13,1	34,0–55,0
		13	Muscular	29,0 ± 4,6	15,9	12,0–44,0
	9	13	Asthenoid	28,7 ± 4,3	15,0	23,0–37,0
		25	Thoracic	31,8 ± 4,5	14,1	13,5–60,0
		19	Muscular	39,5 ± 5,3	13,4	35,0–50,0
		12	Digestive	51,2 ± 5,2	10,1	25,0–88,0
	10	18	Asthenoid	25,9 ± 7,4	28,6	14,0–62,0
		79	Thoracic	35,4 ± 5,6	15,8	14,2–52,0
		9	Muscular	27,0 ± 6,4	23,7	10,0–48,0
		11	Digestive	44,1 ± 4,5	10,2	16,0–64,0
Effective time	7	16	Asthenoid	23,8 ± 4,3	18,1	13,0–36,0
		25	Thoracic	26,1 ± 3,9	14,9	10,0–48,0
		13	Muscular	17,0 ± 5,4	31,8	9,0–45,0
		13	Digestive	15,0 ± 3,6	24,3	11,0–35,0
	8	14	Asthenoid	25,8 ± 3,7	14,3	14,0–38,0
		24	Thoracic	21,9 ± 3,6	16,4	10,0–40,0
		17	Muscular	28,8 ± 4,0	13,9	28,0–33,0
		13	Digestive	30,3 ± 4,5	14,8	20,0–42,0
	9	13	Asthenoid	18,3 ± 1,9	10,4	17,0–21,0
		25	Thoracic	21,7 ± 4,5	20,7	12,0–37,0
		19	Muscular	20,0 ± 3,0	15,1	17,0–23,0
		12	Digestive	22,3 ± 4,5	20,3	11,0–38,0
	10	18	Asthenoid	18,0 ± 2,4	13,3	13,0–24,0
		79	Thoracic	15,0 ± 2,9	19,3	10,0–20,0
		19	Muscular	19,0 ± 2,0	10,5	14,0–26,0
		21	Digestive	21,4 ± 3,8	17,7	15,0–35,0
CFFF, Hz	7	16	Asthenoid	26,6 ± 4,85	18,2	16,2–35,1
		25	Thoracic	30,7 ± 5,27	17,1	6,10–93,3
		13	Muscular	35,7 ± 3,02	8,4	28,3–44,1
		13	Digestive	62,5 ± 4,08	10,7	30,4–72,9

Table 1

1	2	3	4	5	6	7
	8	14	Asthenoid	28,8 ± 4,56	16,2	13,15–50,0
		24	Thoracic	26,8 ± 4,03	15,4	9,13–55,5
		17	Muscular	31,8 ± 5,15	16,6	32,7–38,8
		13	Digestive	34,2 ± 5,59	16,3	25,0–50,0
	9	13	Asthenoid	22,9 ± 4,59	20,0	19,3–29,7
		25	Thoracic	25,4 ± 4,02	16,0	9,82–38,6
		19	Muscular	31,3 ± 2,30	14,5	12,2–22,6
		12	Digestive	31,6 ± 4,48	14,2	19,6–55,5
	10	18	Asthenoid	23,1 ± 3,16	13,7	17,1 – 29,4
		79	Thoracic	21,1 ± 4,32	20,5	18,5 – 55,5
		19	Muscular	17,7 ± 2,63	7,4	14,7– 20,0
		21	Digestive	29,8 ± 6,02	20,2	12,4–48,4
Hits	7	16	Asthenoid	1,3 ± 0,5	38,5	1,0–2,0
		25	Thoracic	1,9 ± 0,9	47,4	1,0–4,0
		13	Muscular	2,0 ± 1,3	65,5	1,0–4,0
		13	Digestive	1,4 ± 0,6	42,8	1,0–2,0
	8	14	Asthenoid	1,8 ± 0,4	22,2	1,0–2,0
		24	Thoracic	1,9 ± 1,5	78,9	1,0–6,0
		17	Muscular	1,8 ± 1,3	72,2	1,0–4,0
		13	Digestive	2,3 ± 0,5	21,7	2,0–3,0
	9	13	Asthenoid	2,5 ± 0,5	20,8	2,0–3,0
		25	Thoracic	2,8 ± 1,3	46,4	1,0–5,0
		19	Muscular	1,9 ± 0,5	26,3	1,0–2,0
		12	Digestive	2,0 ± 1,0	50,1	1,0–3,0
10	18	Asthenoid	2,1 ± 0,9	42,8	1,6–3,6'	
	79	Thoracic	4,0 ± 0,6	15,3	4,0–4,0	
	19	Muscular	2,9 ± 0,6	20,7	2,0–4,0	
	21	Digestive	1,9 ± 1,3	68,4	1,0–5,0	
Omissions	7	16	Asthenoid	1,3 ± 0,4	30,8	1,0–2,0
		25	Thoracic	1,7 ± 0,8	47,0	1,0–3,0
		13	Muscular	2,0 ± 0,8	40,0	1,0–3,0
		13	Digestive	2,0 ± 0,5	25,1	1,0–3,0
	8	14	Asthenoid	2,0 ± 0,7	35,7	1,0–3,0
		24	Thoracic	1,7 ± 0,6	35,3	1,0–3,0
		17	Muscular	1,1 ± 0,5	45,4	1,0–2,0
		13	Digestive	3,0 ± 0,4	13,3	1,0–3,0

Table 1

1	2	3	4	5	6	7
	9	13	Asthenoid	5,0 ± 2,0	40,9	3,0–7,0
		25	Thoracic	1,9 ± 1,1	57,9	1,0–8,0
		19	Muscular	3,5 ± 0,9	14,3	3,0– 4,0
		12	Digestive	3,1 ± 1,2	38,7	1,0–4,0
	10	18	Asthenoid	4,0 ± 0,6	15,5	1,0–3,0
		79	Thoracic	3,0 ± 1,4	46,7	1,0–5,0
		19	Muscular	2,0 ± 0,6	30,8	1,0–3,0
		21	Digestive	2,9 ± 0,6	20,7	2,0–4,0
Reaction of lead	7	16	Asthenoid	4,64 ± 2,14	46,1	1,00–6,33
		25	Thoracic	4,91 ± 1,50	30,5	1,08–7,50
		13	Muscular	6,55 ± 1,70	25,9	3,10–9,40
		13	Digestive	4,50 ± 1,86	41,3	2,08–8,30
	8	14	Asthenoid	4,46 ± 1,93	43,3	2,14–8,42
		24	Thoracic	5,79 ± 1,45	29,9	3,07–9,28
		17	Muscular	5,48 ± 1,48	25,6	4,46–8,34
		13	Digestive	5,18 ± 0,86	14,6	4,66–6,53
	9	13	Asthenoid	5,68 ± 2,10	37,0	3,50–9,88
		25	Thoracic	5,26 ± 1,70	32,3	2,00–9,12
		19	Muscular	6,88 ± 0,96	13,9	5,92–7,83
		12	Digestive	4,35 ± 1,82	41,8	1,06–6,23
	10	18	Asthenoid	5,21 ± 0,90	17,3	4,30–6,20
		79	Thoracic	4,70 ± 1,65	35,1	1,12–9,08
		19	Muscular	6,83 ± 2,04	30,0	3,02–10,12
		21	Digestive	4,60 ± 1,40	30,4	1,15–6,0

Response time (RT) in earlier age (7 years) is minimal in boys of the asthenoid type of constitution, maximal in boys of the muscular type of constitution. At the age of 8, the smallest RT is recorded in boys of the digestive type, the largest RT – boys of the digestive type of constitution. At the age of 9, the best results were found in boys of the thoracic type, the worst – boys of the digestive type of constitution. At 10, the shortest response time was found in boys of the muscular type, the largest – boys of the asthenoid type of the constitution.

The number of touches (TN) is the smallest in 7-year-old schoolchildren of the muscular type, the largest in the boys of the digestive type of constitution. At 8 years, this indicator is the best value for boys of the digestive type and the worst is for the asthenoid type of constitution. At the age of 9, the number of touches, on the contrary, the digestive type is worse, and boys of the asthenoid and thoracic type is better. By the age of 10 the best results in this test were demonstrated by children of the muscular type, the worst – boys of the digestive type of constitution.

The effective time in 7 years is minimal in boys of muscular type and maximal in boys of the thoracic type of constitution. In 8 years, the effective time, on the other hand, is minimal in the thoracic type, while the digestive type of the constitution has the maximum one. In 10 years, this indicator is minimal in boys of the thoracic type, and is maximal in boys of the digestive type of constitution.

CFFF (the critical fusion frequency of flickering) in all age groups is higher for boys of the digestive type of constitution. The lowest values of this indicator have 7 and 9 years old boys of the astenoid type, 8 years old boys of the thoracic and 10 years old boys of the muscular type of the constitution.

Maximal **number of hits** had 7 years old boys of muscular type and minimal – boys of the astenoid type of constitution.

8 years old boys of the digestive type had the greatest number of hits and significantly less – boys of asthenoid and muscular types of constitution. At the age of 9, the number of hits is higher in boys of the thoracic and minimal in children of muscle types of the constitution. 10 years old boys of thoracic type of constitution had maximal number of hits and minimal – boys of the digestive type of constitution.

The number of omissions in the group of 7 years old boys of asthenoid type was minimal and maximal – in boys of the muscular and digestive type of constitution. At the age of 8, the number of passes was minimal in the muscular type and maximal – in boys of the digestive type of constitution. At the age of 9, the indicator was minimal in the thoracic and maximal in the asthenoid type of the constitution. At the age of 10, the number of omission was maximal in boys of asthenoid and minimal in boys of the muscular type of constitution.

The **reaction of lead** in 7 years old boys of asthenoid type of constitution is minimal and maximal – in boys of the muscular type of constitution. At the age of 8 the reaction of lead was smaller in boys of the asthenoid type and significant in boys of the thoracic type of constitution. At the age of 9 and 10, the lead response is minimal in children of digestive and maximal in boys of the muscular type of constitution.

Discussion of the Results. Information in terms of general patterns and directions of development of psychological and physiological functions of 7–10 years old boys is presented in table 2.

Table 2

Development of Psychological and Physiological Functions in 7–10 Years old Boys of Different Types of Constitution

Types of constitution	Age, Years	Braking in the Central Nervous System	Coordination of Movements	Coordination of Attention	Lability of the Visual Analyzer	Accuracy of Movements	The Predominance of Excitation
Asthenoid	7	→ (И)	→(И)	→(И)	→(И)	→(И)	→(И)
	8	→	↑	↓	↑	↑	↓
	9	↓	↑↑	↑↑	↓↓	↑	↑
	10	↓	↑	→	↑	↓	↑
Thoracic	7	→ (И)	→(И)	→(И)	→(И)	→(И)	→(И)
	8	→	↑↑	↑↑	↓	→	↑
	9	↓↓	↑	→	↓	↑↑	↑
	10	↓	↓	↑↑	↓	↑↑	↓
Muscular	7	→(И)	→(И)	→(И) ↓↓	→(И)	→(И)	→(И)
	8	↓↓	↓	↑	↑	↓	↓
	9	↓	↑	↑	→	↑	↑
	10	↓↓	↑↑	↑↑	↓↓	↑	↑
Digestive	7	→(И)	→(И)	→(И)	→(И)	→(И)	→(И)
	8	↓	↑↑	↓↓	↓	↑	↑
	9	↓	↓↓	↑	↓	↓	↓
	10	↓	↑	→	↓	↓	↓

↓ – moderate function decrease; ↓↓ – marked function decrease; → – constancy of functions; ↑ – moderate function increase; ↑↑ – pronounced function increase; И – initial state;
↓ – the best in terms of this indicator to the age of 10.

The obtained results allow us to conclude the following issues:

1) development of child psychological and physiological functions has a pronounced heterochronic character;

2) the heterochronicity of the formation of the psychological and physiological functions of the central nervous system is substantially interrelated with the type of the child's constitution.

The general principle of child development of any type of constitution is a gradual, steady decline in the inhibitory force of the central nervous system. Mostly, this process is expressed in children of the muscular

type of the constitution, in which there are 2 qualitative «leaps» in the improvement of the BP index (8 and 10 years old). The balance of the inhibition and excitation processes at the age of 10 is maximal in boys of digestive and thoracic types, and minimal in the muscular type of the constitution.

The development of coordination of movements, according to the data of PE in boys of the thoracic, muscular, digestive types of the constitution has wavy character. For the thoracic and digestive types, there is a marked improvement in the coordination of movements in 8 years old boys and stabilization of this indicator in 9–10 years old boys. Children of muscular type of constitution have improved coordination of movements only by the age of 10. A stable improvement of this indicator throughout the entire period of child development was revealed only in boys of the asthenoid type of the constitution.

The development of the ability to concentrate attention also has wavy-like dynamics in most constitutional types. This is typical for the asthenoid, muscular, digestive types of constitution. In boys of the thoracic type of constitution, the ability and concentration of attention with age steadily increases, which makes possible to consider this type of constitution to be the best among the rest.

Consistency, which is typical for all types of the constitution, is a decrease in the lability of the visual analyzer. This process is mostly pronounced in boys of the digestive type of constitution. However, children with this type of constitution have a very high lability in the visual analyzer at a young age (7 years). Therefore, despite the age-related decline, this indicator by the age of 10 in boys of the digestive type of constitution is higher than in the rest of the constitutional types.

Accuracy of movements according to the number of hits with age increases, this process is most pronounced in boys of the thoracic type of constitution, in which the accuracy of movements sharply increases at the age of 9 and 10.

Thus, for the totality of the studied psycho-physiological indicators, the thoracic type of constitution is the most favorable for sports selection for swimming in boys at the age of 10. This type of constitution is characterized by high ability and concentration of attention, increased accuracy of movements, balanced excitatory and inhibitory processes of the central nervous system.

Somewhat less favorable is the muscular type of constitution, which, however, by the age of 10 has a high strength of excitation processes. Marginal types - asthenoid and digestive are less favorable for achieving high sports results. However, asthenoid-type boys can successfully engage in those sports that require a high level of coordination abilities, precise coordination of small motor acts. Digestive type of the constitution at the age of 7–10 is characterized by high lability of the visual analyzer, which is also useful for some sports activities.

Conclusions. Thus, the conducted research allows us to conclude that it is advisable to test the psychological and physiological indicators of children taking into account their type of constitution.

The algorithm of the sports selection procedure should include the following issues:

1) determination of the children type of the constitution. Analysis of the initial level («sufficiency») of psychological and physiological functions;

2) an analysis of the annual dynamics of indicators characterizing the processes of excitation and inhibition of the central nervous system, coordination of movements, concentration of attention;

3) the implementation of an operational correction of the training process on the parameters of psychological and physiological functions that have unsatisfactory dynamics in a particular type of constitution.

Sources and Literature

1. Штефко В. Г., Островский А. Д. Схемы клинической диагностики конституциональных типов. Москва; Ленинград: Гос. мед. изд-во, 1929. 79 с.

References

1. Shtefko, V. H. & Ostrovskiy, A. D. (1929). *Skhemy klinicheskoi diahnostikiy konstitutitsyonalnykh tipov* [Diagrams of clinical diagnostics of constitutional types]. M., L., Hos. medits. izd-vo, 79.

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