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Psychophysiological Characteristics of Primary Schoolchildren from the Far North During Their Adaptation to the South of the Kranoyarsk Region

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The article discusses the changes in psychophysiological characteristics of children from the Far North in the course of their adaptation to the climate and geographic conditions of the south of the Krasnoyarsk Region. Primary schoolchildren living in the Far North demonstrate an increase in the time of their sensory motor responses and their adaptation potential after their recreation in the south of the Krasnoyarsk Region. The article shows that the children from the North are generally characterised by the shorter time of sensory motor responses.

Keywords: adaptation, response speed, psychophysiological indicators.

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Research area: pedagogy.

According to the strategy of social and economic development of Siberia by 2020, improving the quality of life and preserving the culture of the peoples of the North are high priorities among the geo-economic and geo-political interests of Russia. Therefore, it is important to take into consideration the quality of human potential in these areas. Also, it is

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crucial to understand the psychophysiological state of people residing in the Far North, as many indicators differ sharply from those which were recorded in central Russia and might have changed in number within the last decade [Platonov, 2005, p. 143]. The recent years have seen a decline in health of people living in the north [Manchuk, 2012, p. 6].

Adaptation potential depends directly on the functional reserves of the human body [Agadzhanian, 2002, p. 156; Mal'tseva, p. 14]. The high functional reserves help the body maintain good health without overstressing its regulatory systems.

In such conditions one of the ways to improve the health of schoolchildren is by organising trips to central and southern Siberia for the purpose of recreation and the replenishment of their reserves. Thus, the ***purpose*** of our research was to define the psychophysiological state of primary schoolchildren residing in the Far North during their stay in the south of the Krasnoyarsk Region.

We examined 34 schoolboys and schoolgirls who had been living in the Far North all their life. Their age ranged from 7 to 10 years old. The group spent 44 days in a recreational camp in the south of the Krasnoyarsk Region. The study of their psychophysiological features was carried out on the 5th and 6th day after the arrival of the group and 2 days before their departure.

We measured the level of the children's anxiety at school (the Zung Self-Rating Anxiety Scale), adaptation potential (the method of R.M. Baevski) and sensory motor responses (a simple visual-motor response task, a complex visual-motor response task and a complex three-stage visual-motor response task with a choice of two alternatives).

The indicators of sensory motor responses were recorded using the testing device UPFT-1/30 "Psychophysiologist".

The statistical analysis of data was carried out using Microsoft Office Excel. We employed the Kolmogorov–Smirnov test to compare the samples to a normal distribution, the Mann–Whitney U test to determine if these samples were identical or not (whether they were different from a normal distribution), and Spearman's correlation coefficient to perform a correlation analysis.

Discussion of results. The quantitative indicator of adaptive mechanisms is *adaptation potential (AP).*

On their arrival in the south of the Krasnoyarsk Region, 35.3 % of children experienced the stress of adaptation, while the rest 64.7 % demonstrated a satisfactory degree of AP (Fig. 1). However, the repeated AP test (N=32) revealed the change in these indicators. 21.9 % of schoolchildren underwent the stress of adaptation, whereas 78.1 % of children had a satisfactory degree of AP.

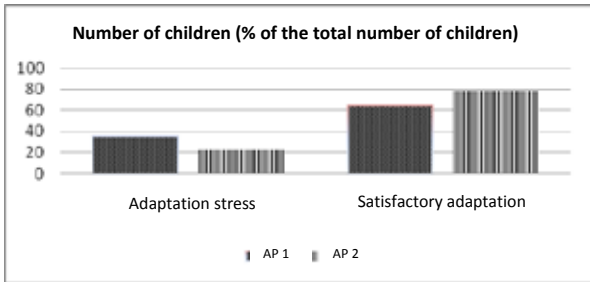

Fig. 1. The breakdown of the functional state of children

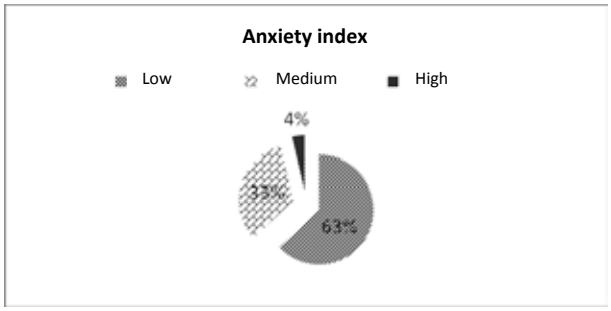

Fig. 2. The Anxiety Test: Results

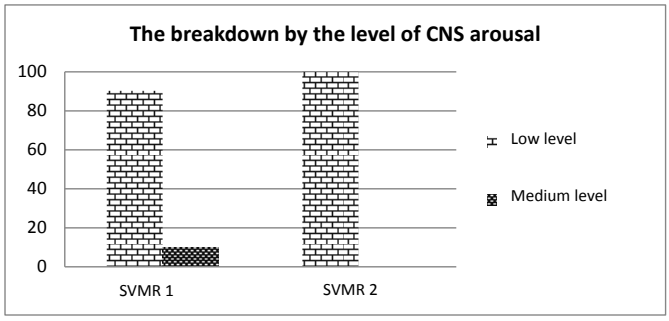

Fig. 3. The results of the SVMR task

The results of the Zung Self-Rating Anxiety Scale (AI stands for Anxiety Index) revealed the following trends (Fig. 2): low anxiety (63 %), medium anxiety (33.3 %) and high anxiety (3.7 %), with the average index being 39.7 (low anxiety). These figures show that the group of children were relaxed and did not experience any discomfort or nervousness.

The results of the *simple visual-motor response* task (SVMR) done in two groups are presented in Fig. 3.

In the majority of cases the level of the arousal of the central nervous system (CNS) was low (90.3 %). It was characterised by delayed responses, the considerable inertness of neural processes, the low level of regulatory mechanisms and the low functional capacity of the CNS. 9.7 % of children were characterised by a medium and low level of the arousal of the CNS. The speed of their response was lower than the average, highly stable, with a high degree of inhibition and low functional capacity.

Also, the level of functional capacity was measured on the basis of the *complex visual motor response* task (CVMR) (Fig. 4).

To define the main features of neural processes (the magnitude of excitation, inhibition and mobility) we used the method of the *complex three-stage visual motor response with a choice of two alternatives* (CVMR-3).

Due to the fact that the measurements were taken twice, the responses recorded for the first time are marked with Index 1, and those recorded for the second time – with Index 2 (Fig. 5). The Fig. shows that the majority of children were characterised by the low magnitude of excitation. That is, 33.4 % of subjects had a medium magnitude of excitation. On their departure 72.3 % of schoolchildren demonstrated the low magnitude of excitation.

The results of comparing the simple visual motor responses, the complex visual motor responses and the complex three-stage responses can be found in Table 1.

The given data (Fig. 3 and Fig. 4) demonstrate that in all kinds of sensory motor response tasks, during the first measurement the average time of response was considerably less than the time of response during the repeated measurement.

Meanwhile, it is known that the average time of the simple visual motor response to the photic stimulus varies and can amount to 250 to 300 ms, which is less than the results we obtained [Glinov, p. 299; Medvedeva, 2011; Milov, 2001, p. 20; Nekhoroshkova, 2011, p. 43].

The speed of all the types of sensory motor responses we tested had decreased by the end of the study.

When comparing the indicators of adaptation potential and the time of sensory motor responses, we discovered that the average response time was lower in the case of children with a lower level of AP. This phenomenon can be explained by a higher level of the arousal

Table 1. Visual motor responses of the children at different stages of their holiday

No	Type of response	Average response time, ms		N
1	Simple visual motor response			
	SVMR 1	379±134*		27
	SVMR 2	528±173*		27
2	Complex visual motor response			
	CVMR 1	566.4±203.4*		24
	CVMR 2	725.3±215.8*		24
3	Complex three-stage visual motor response			
	CVMR-3.1	644.3±179*	Stage 1	19
		716.1±254.7*	Stage 2	19
		740±199.1**	Stage 3	25
	CVMR-3.2	766.9±164.1*	Stage 1	19
		930.8±275.8*	Stage 2	19
		841.8±220.8**	Stage 3	25

**statistical significance – p≤ 0.01*
**statistical significance – p≤ 0.05*

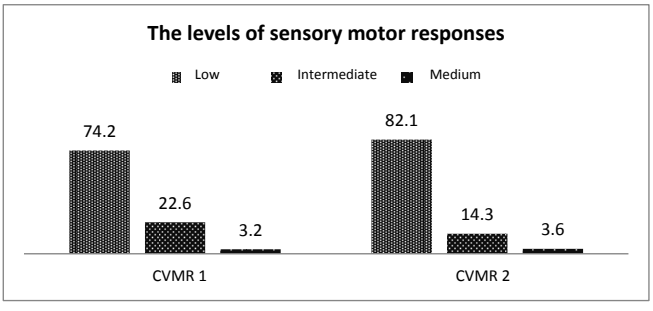

Fig. 4. The results of the CVMR task

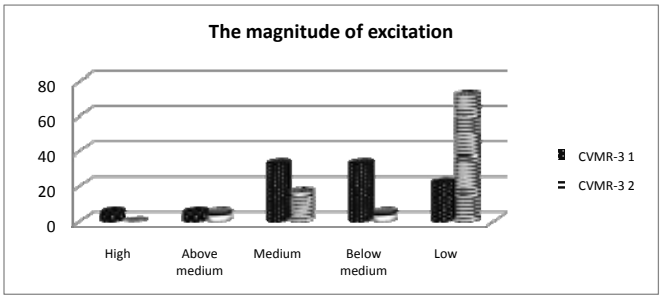

Fig. 5. The results of the CVMR-3

of their nervous system. For children with a satisfactory level of adaptation the time of the simple sensory motor response amounts to 339.6±66.4 ms, which, considering that $p \leq 0.05$, is certainly less than the response time typical of children experiencing adaptation stress (431.9±172.5 ms).

In conclusion, we shall formulate the features of psychophysiological responses which characterise children aged 7 to 10 years during their adaptation to new climate and geographical conditions:

1. The adaptation potential of children aged 7 to 10 years old, residing in the Far North, has a satisfactory level in 64.7 % of cases, which points to high functional capacity. Meanwhile, about 35.3 % of children experience the stress of their regulatory mechanisms. After their recreation the adaptive capacity of schoolchildren has increased: 78.1 % - satisfactory adaptation, 21.9 % - adaptation stress. Hence, recreation activities have a positive influence on adaptation potential. In the course of 40 days the number of children with a satisfactory level of adaptation potential has increased by 14 %.

2. The time of sensory motor responses typical of children from the North has a high value and certainly increases after the period of recreation. This can serve as a indicator of successful adaptation.

3. The children with a satisfactory level of adaptation have a lower indicator of simple visual motor responses, so the speed of their sensory motor responses is higher. This may be considered as a characteristic of children from the North.

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Психофизиологические показатели младших школьников Крайнего Севера при адаптации к условиям юга Красноярского края

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Статья посвящена изменениям психофизиологических показателей детей Крайнего Севера при адаптации к климатогеографическим условиям юга Красноярского края. Младшие школьники, проживающие на Крайнем Севере, после отдыха на территории юга Красноярского края показывают повышение времени сенсомоторных реакций, прирост адаптационного потенциала. Показано, что у детей Севера регистрируются низкие показатели времени сенсомоторных реакций.

Ключевые слова: адаптация, скорость реакции, психофизиологические показатели.

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Научная специальность: 13.00.00 – педагогические науки.