Asian Journal of Technology and Applied Sciences
ISSN: 2301-xxxx (online) | IF: 10.01 | Vol: 1, issue 1
Available: http://asiansciencejournal.org

INDICATORS OF PHYSICAL WORK CAPACITY AND HEMODYNAMICS OF SCHOOLCHILDREN LIVING IN VARIOUS ECOLOGICAL CONDITIONS

Tukhtasinova Zarifakhon Mukhamadjanovna
Lecturer, Department of Zoology and General Biology
Fergana State University

Abstract: This article examines the physical work capacity, mental activity, and hemodynamic parameters of the cardiovascular system in schoolchildren living under various ecological conditions in the Fergana Valley. The study was conducted with the participation of 3rd, 8th, and 11th-grade students from secondary schools in the cities of Kuvasoy, Fergana, and Vodil. The PWC170 test was used to determine physical work capacity, the Anfimov correction table was used to assess mental work capacity, and indicators of heart rate, arterial pressure, systolic and minute blood volume, and maximum oxygen consumption were used to analyze the functional state. The obtained results were processed using mathematical and statistical methods, and the influence of environmental factors on the functional capabilities and adaptive reactions of the students' bodies was determined.

Keywords: ecological conditions, school children, physical work capacity, mental work activity, PWC170 test, hemodynamic indicators.

The development of industrial enterprises and vehicles has led to negative changes in the ecology of cities in the Fergana Valley. As a result of such adverse effects, some undesirable outcomes may arise in the growth, development, work capacity, and productivity of human and animal organisms, as well as in the efficiency of vegetative functions. Insufficient research has been conducted on the physical work capacity and functions of the main vegetative systems involved in physical activities of people living in environments with diverse ecological conditions. However, such studies are essential for developing effective measures and strategies to ensure proper growth, development, and mental and physical work capacity of the organism

Our research is devoted to identifying the possibility of differences in the physical development, mental and physical work capacity of schoolchildren living in different environmental conditions, the vegetative functions that provide them, and the regularities of reflexes that ensure the adaptation of the organism to environmental situations. Physiological observations and determination of students' work capacity were conducted before the start of the morning shift classes and after the end of classes in the academic shift. Observations were conducted in the autumn and winter months in students of grades 3, 8, and 10 of schools No. 2, 1, and 4 of Kuvasay, Fergana, and Vodil.

The PWC170 test was employed to assess the physical work capacity of students. We utilized Anfimov's correction table to evaluate mental work capacity. To determine the physiological classification of the effects of physical movements, changes in hemodynamic indicators were analyzed.

Heart rate, systolic and minute blood volumes, respiratory rate dynamics, and maximum oxygen intake were observed. The parameters of students' physical preparedness, assimilation of educational material, and changes in attention were regularly taken into account. The results of the study showed that there are significant differences in the physical development and work capacity of students living in different environmental conditions. A total of 165 boys and 172 girls participated in the studies.

Asian Journal of Technology and Applied Sciences
ISSN: 2301-xxxx (online) | IF: 10.01 | Vol: 1, issue 1
Available: http://asiansciencejournal.org

The obtained data were processed and analyzed using mathematical and statistical methods. Determination of the physical development of students living in different ecological conditions of the Fergana Valley showed that there are certain differences between boys and girls living in Vodil, Fergana, and Kuvasay, but these differences are not statistically significant. In schoolchildren living in different cities, the heart rate, systolic and minute volumes of blood do not differ from each other in the morning when children are at rest. With an increase in the volume of work performed on the veloergometer, the heart rate and maximum arterial pressure increase proportionally.

According to experimental data (Table I), the physical performance of schoolchildren living in the conditions of Vodil is higher than that of students living in the cities of Kuvasay and Fergana. Physical work capacity always decreases after the end of classes in the morning shift.

Table I

Decrease in physical work capacity of 11th grade students living in different environmental conditions after lessons in the shift. n=20

cities	situation	holat	PWS170 kgm/min/kgweight					
			boys			boys		
			$\bar{x}$	Sx	$S\bar{x}$	$\bar{x}$	Sx	$S\bar{x}$
Kuvasay	Before lessons	Darsdan oldin	12.5	1.85	0.41	5.7	0.66	0.15
	After lessons	Darsdan keyin	10.0	2.00	0.45	5.0	0.85	0.19
Vodil	Before lessons	Darsdan oldin	15.4	1.26	0.36	11.6	3.26	0.80
	After lessons	Darsdan keyin	11.6	0.95	0.27	8.7	1.32	0.29
	P	P	< 0.01			< 0.01		

The study of the maximum amount of oxygen absorbed by the human body showed that it is not the same in students living in different ecological conditions. (Table 2) The maximum amount of oxygen consumed by children living in the Vodil region, where the atmosphere is considered clean, is 23% higher than the amount of oxygen consumed by children living in the city of Kuvasay. After the end of classes in the morning shift, both maximum oxygen intake and the child's physical work capacity decrease. This condition can only be explained by the fatigue that develops during study and the resulting fatigue.

Table 2

Decrease in the maximum oxygen uptake of 11th-grade students living in different ecological conditions after the end of classes. n=20

cities	situation	PWS170 kgm/min/kgweight					
		boys			Girls		
		$\bar{x}$	Sx	$S\bar{x}$	$\bar{x}$	Sx	$S\bar{x}$
Kuvasay	Before lessons	43.8	5.01	1.25	32.8	3.25	0.56

Asian Journal of Technology and Applied Sciences
ISSN: 2301-xxxx (online) | IF: 10.01 | Vol: 1, issue 1
Available: http://asiansciencejournal.org

	After lessons	39.7	5.52	1.33	32.1	3.65	0.66
Vodil	Before lessons	51.6	3.98	1.32	43.9	7.94	1.35
	After lessons	45.6	3.54	2.09	38.6	3.80	0.72
	P	<0.01			<0.01		

Reactions arising from performing the recommended volume of work for students are characterized by an increase in maximum oxygen uptake. The maximum amount of oxygen consumed during high-intensity physical work is 18% higher for 11th-grade boys and 34% higher for girls living in the Vodil region. ($p<0.01$) Under the influence of standard work, the pulse rate of children living in Vodil increases by 97%, maximum arterial pressure by 24%, systolic blood volume by 36%, and cardiac output by 73%. These changes are 79%, 23%, 12%, and 98% respectively among students in the Kuvasay region. These differences may explain the relatively lower work capacity of students from Kuvasay.

Thus, students living in Vodil and Kuvasoy do not differ from each other in terms of physical development and cardiovascular function. However, our findings indicate that the hemodynamic capabilities of students living in Kuvasoy are limited, resulting in their relatively lower work capacity. Consequently, the ecological situation does indeed have significance for human growth and development.

REFERENCES

1. Shah, SS and Divan, SJ (2025). Does physical fitness affect the academic achievements of school students? - A study. Bulletin of Faculty of Physical Therapy, 30, 54. DOI:10.1186/s43161-025-00309-8 (English scientific article about physical fitness and school students) Springer
2. Wang, Q., Wang, H., Du, B., et al. (2024). The relationship between physical activity and cardiovascular parameters in 7-year-old children: A cross-sectional study in China. BMC Pediatrics, 24, Article 522. (Original research on the relationship between physical activity and cardiovascular parameters) SpringerLink
3. Balaeva, Sh. - M., 2021. Influence of new educational technologies on the level of physical activity and functional capabilities of the cardiovascular system of students. Azerbaijani Medical Journal. (Physical activity and cardiovascular system in the context of medicine and pedagogy) azmedjournal.com
4. International Journal of Biometeorology (2025). Increased loss of physical work capacity due to heat stress. Volume 69, pp. 3073-3083. (Effects on heat stress and physical performance) Springer
5. Ernazarov G.N. Regional Features of Physical Education of Students. Tashkent 2022. p.160.
6. Ernazarov G.N. Regional Features of Physical Education: Textbook. Fergana, 2023, p. 166.