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Modeling the regimens of physical activity for junior schoolchildren

Introduction. Today the problem of implementing physical activity to enhance physical health in the European region and in particular in Ukraine has become a global character. In general, the WHO European Region lives every fifth person is characterized by a low degree or no physical activity, especially among children and adolescents [1, 2].

Due to limited physical activity of children appropriate to make greater use of energy-relevant exercises at the organization of the physical education process in the regime of the school day for physical education classes, extracurricular, after-school forms, etc. [3, 4, 5].

Research hypothesis: it is assumed that the results obtained allow to simulate modes of physical activity of schoolchildren and to predict the required level of energy consumption for primary school children.

Aim: analysis modes of physical activity of varying intensities of junior schoolchildren.

Methods: analysis of scientific literature; physiological methods (chronometry, monitoring of heart rate, ergometry, gas analysis), mathematical and statistical methods for processing the results of the study.

Results and discussion. Complex testing features of children was carried out on the basis of laboratory theory and methodology of sports training and backup capabilities athletes Scientific Research Institute the National University of Ukraine on Physical Education and Sport.

Studies in laboratory conditions using a highly informative equipment (treadmill LE-200 CE, a fast automatic analyzer of the type "Jaeger", Germany, the remote sensor «Sport Tester Polar», Finland) was performed to analyze the dynamics of indicators characterizing the state of the cardiovascular and respiratory systems function during physical activity of 7-9 year old boys (n = 36) in a wide range of physical activity (Fig.1).

Figure 1. The process of test loads

Functional features of the child's body clearly reflected in the reactions of adaptation to physical stress, which is manifested in the adaptation of the cardiovascular and respiratory systems, limiting the manifestation of physical performance [6, 7, 8].

Computer processing of the data set is made of test loads, which served the children of primary school age in real time with an interval of 10 s. Values were obtained by the following physiological parameters: pulmonary ventilation (VE, ml·min^{-1}), respiratory frequency (fT, min), tidal volume (VT, l), oxygen consumption (VO_2, ml· min^{-1}), the level of carbon dioxide CO_2 (VCO_2, ml·min^{-1}), gas exchange ratio (VCO_2/VO_2), ventilation equivalent for O_2 ($EQO_2 = VE/VO_2$) and CO_2 ($EQCO_2 = VE/VCO_2$), oxygen pulse (VO_2/HR, ml· bmp $^{-1}$).

In the practice of physical education primary school children revealed dependence allows to estimate the intensity of substantiated physical activities offered in different forms of exercise, physical load on the performance of their energy value.

Correlation between heart rate and VO_2 (r = 0,81-0,89), bearing the linear character, allowed to enter the model to calculate VO_2 consumption depending on heart rate during physical exercise for primary school children of 7-9 years (Table 1).

Table 1

Models of oxygen consumption boys 7-9 years

Age, years (n=36)	Linear regression equation to determine the oxygen consumption	Correlation coefficient, r	Coefficient of determination, r^2	Standard error of estimation models, ε	Level of meaningfulness, p
$\dot{V}O_2$, ml·min^{-1} by the average HR of work					
7	$Y = -678,651 + 9,336 \times X_1$	0,87	0,76	-2,96	p<0,01
8	$Y = -808,686 + 10,453 \times X_1$	0,89	0,80	-2,88	p<0,01
9	$Y = -800,456 + 10,786 \times X_1$	0,81	0,66	-2,88	p<0,01
$\dot{V}O_2$, ml·min^{-1} because the total cost ΣHR of work					
7	$Y = -23,45+0,92 \times X_2$	0,75	0,52	1,70	p<0,01
8	$Y = -26,91+ 0,98 \times X_2$	0,77	0,60	1,70	p<0,01
9	$Y = -29,88 + 0,99 \times X_2$	0,79	0,65	1,70	p<0,01

Notes: Y– value of oxygen consumption during physical activity (ml·min $^{-1}$); X_1– average heart rate during physical activity (bmp·min $^{-1}$); X_2 – total pulse rate during physical activity (bmp).

The use of models for calculating VO_2, heart rate, depending on energy value allowed the calculation of physical activity in physical education lessons and other forms of organization of exercise with the younger students in Ukraine.

Knowing the pulse energy cost of various physical exercises, you can pick up these muscle load, which would be optimal for maintaining physical health of schoolchildren during the day.

Conclusions: Comprehensive studies of the functional state of the cardiovascular and respiratory systems younger schoolchildren in the laboratory were of great importance for the understanding of the functioning of regulatory systems. The results of the study allowed to determine the heart rate or ΣHR as indicators that can be used for operational monitoring of energy consumption in primary school children during physical exercise.

Based on the results of research can develop new or improved traditional forms of organization of physical education students, the optimization of their physical activity to achieve maximum health effect.

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