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FUNCTIONAL STATE OF MODERN SCHOOLCHILDREN WITH DIFFERENT PHYSICAL WORKING CAPACITY LEVEL

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Abstract

The research purpose is to find out the influence of physical working capability level appeared at the maximal zone, submaximal, high and reasonable power to organism's functional state and effectiveness of intensive cognitive activity among children at critical periods of development under the conditions of informative-educational environment of modern school. 6-7 aged children (n=134) and 11-12 aged immature girls (n=221) related by the health state to the main medical group have taken part in the research. The research results allow to make a conclusion that at critical periods of development the physical working capability causes a significant influence on children's FS changes under intensive cognitive activity. A high level of aerobic and anaerobic glycolytic capabilities appeared predominantly at reasonable zones, high and submaximal power on one hand and a high level of anaerobic alactic capabilities appeared in the maximal zone power on the other hand provide the opposite functional effect. The first ones provide the decrease of extra psychophysiological reactivity, increase of intensive cognitive activity effectiveness, and possible, the personal anxiety decrease, the second ones in opposite provide predominantly hypermobility of autonomic systems of 6-7 supply of activity. The obtained data show that the improvement of intensive cognitive activity effectiveness among children and their FS normalization at the conditions of informative-educational environment of modern school can be reached on the base of directed and balanced increase of physical working capability at different zones of relative power.

Keywords: Intensive cognitive tensions, physical performance level.

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1. Introduction

The increasing information of all public life spheres causes the multivalued influence on the success of education, health and schoolchildren's functional state (FS). It is known if a total value of informative tension overpasses the schoolchildren's capabilities by its processing at a time when sedentary life style, informative over tension can appear as a result of cognitive activity effectiveness deterioration, psychological stress development, school pathology growth and sickness rate increase (Quas, 2014; Kuchma, 2016; Resaland, 2016).

The most expressed adverse changes of FS and cognitive activity effectiveness among children are observed at the critical periods of development. Two critical stages of development examined as the critical periods are pointed out at a school age. This age is the beginning of systematic education at school and adolescence. The school entry deals with the expressed functional tension, low cognitive activity effectiveness, unstable working capability, and high psychophysiological cost of education (Razvitie mozga…, 2009; Escobar, 2013). The tension of this period is identified primarily when a child is intensively being manipulated with the complex of "unaccustomed" factors of educational environment, adaptation to which demands maximal mobilization of social and biological organism's reserves. Against this background the high informative tensions, complex tasks disagreeing to the aged and individual capabilities of first-graders, to the "punishment" situation and public speech, marks and critics can provide the deterioration of their FS, forming of chronic psychological stress, anxiety increase, and development of school disadaptation and increase of sickness rate (Brjazgunov, 2008; Berk, 2012; Quas, 2014; Kuchma, 2016).

No less important meaning, the examining problem is getting at a critical period of ontogenesis characterized with qualitative transformations of physiological and psychological functions dealing with puberty process. The age of adolescence is the period of problems conditioned with psychosexual development, roles conflicts, status indeterminacy and instability of a schoolchild's social values (Brjazgunov, 2008; Fiziologija razvitija…, 2010; Galanti, 2016). To a considerable degree, it deals with the decrease of effectiveness of central regulatory mechanisms determining a voluntary regulation and cognitive process development (Razvitie mozga…, 2009). During puberty, schoolchildren's psychophysiological reactions even to "habitual" informative tensions come infrequently out of optimal borders. While using inadequate informative tensions against the background of irrational organization of educational process and insufficient motor activity the state of unproductive tension which can lead to decrease of organism's reserves and working capability, development of hidden and then to obvious pathology is being formed (Razvitie mozga…, 2009; Krivolapchuk, 2017). In this connection with the whole acuity, the problem of FS optimization of schoolchildren's organism at the process of education, cognitive activity effectiveness increase and decrease of its psychophysiological cost, preventive treatment of negative consequences of extremely high informative tensions appear.

2. Problem Statement

One of the means of the given problem solving is regular physical exercises lessons. It is proved that physical exercises suitable to aged and individual peculiarities of schoolchildren cause the expressed influence on their health, encouraging improvement of physical working capability and motor readiness,

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overweight lowering, cardiovascular disease preventive measures and metabolic disorder, osseous tissue strengthening (Janssen & Leblanc, 2010; Global recommendations…, 2010; Resaland, 2016). The physical working capability role, as the most important condition of children's FS optimization, educational activity of which passes more often under the raised informative tensions, psychical tension, mental fatigue and expressed hypokinesia is the most important at critical ontogenesis periods, characterized by qualitative morphofunctional reformation of main physiological systems against the background of complicating interrelations between biological and social factors of development (Brjazgunov, 2008; Razvitie mozga…, 2009; Silk, 2009; Spear, 2009; Fiziologija razvitija…, 2010; Berk, 2012; Quas, 2014; Krivolapchuk, 2017). The marked circumstances give the base to consider that exactly at the critical periods of development the rationally organized physical exercises lessons directed to the increase of physical working capability level can be the important factor of schoolchildren's organisms' FS improvement. Nevertheless, in spite of the present data the issues dealing with the influence of physical working capability level on FS and schoolchildren's cognitive activity effectiveness at these stages of development are still opened.

3. Research Questions

As it was mentioned above, at present, the problem of preventive treatment and correction of unpleasant FS changes and the increase of children's cognitive activity effectiveness at the critical periods of development under the conditions of informative-educational environment of modern school is arising. One of the solving ways of the given problems can be the directed increase of schoolchildren's physical working capability. The level of physical working capability development is being researched as the factor determining a human being's FS peculiarities under intensive cognitive activity and psychosocial stress by many researchers. At the same time, it should be said about the lack of works devoted to the study of physical working capability influence appeared at different zones of a relative power to schoolchildren's FS changes under intensive informative tension at the critical periods of development.

4. Purpose of the Study

The research purpose is to find out the level of physical working capability influence, appeared at the zone of maximal, submaximal, high and reasonable power on organism's FS and intensive cognitive activity effectiveness among the children at critical periods of development under the conditions of informative-educational environment of modern school.

5. Research Methods

6-7 aged children (n=134) and 11-12 aged immature girls (n=221) related by the health state to the main medical group have taken part in the research. A wide spectrum of pedagogical, physiological-hygienic psychological and mathematical methods suitable for FS mark, intensive cognitive activity effectiveness, physical working capability and motor readiness of schoolchildren at the critical periods of development has been used. The study of peculiarities of children's organism's FS with the account of physical working capability level and motor readiness were being performed on the base of usage of more than 90 pedagogical, physiological, psychological and behavioral indexes.

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FS changes and cognitive activity effectiveness were being studied while performing informative tensions of different tension degrees. The research was being performed on the optimal working capability days. Functional state was marked in three experimental situations: “background”; “autotempo”; “maximal tempo”. Along with this, organism’s FS and effectiveness of intensive cognitive activity have been studied in dynamic of educational week before and after lessons.

Heterogeneous set of functional, ergometric and motor tests allowing to diagnose the physical working capability at different zones of a relative power were used during the study. In the course of statistical processing of the obtained data with the help of percentile scale the gradation of the whole testees selection by three working capability levels at the maximal, submaximal high and reasonable power was performed.

6. Findings

The obtained results show that the high level of aerobic and anaerobic glicolitic capabilities appeared predominantly at the reasonable, high and submaximal power zones, on one hand, and the high level of anaerobic allactic capabilities appeared at the zone of maximal power, on the other hand, provide the opposite functional effect. The first ones cause the decrease of extra stress reactivity, increase of intensive cognitive activity effectiveness and, perhaps, the decrease of personal anxiety, the second ones in opposite provide predominantly hypermobility of system of autonomic supply activity.

At the research, the largest quantity of statistically important intergroup differences have been identified in schoolchildren comparison to different working capability levels at the zones of reasonable and high power. It has been stated out that children and adolescents with a high level of aerobic capabilities of organism and an average stamina differ with an increased mental working capability and physiological resistance to stress, with decreased psychophysiological cost of intensive cognitive activity and personal anxiety. The most expressed differences ($p<0,05$-$0,001$) between the testees with different level of aerobic readiness were identified to autonomic supply indexes. In addition, 11-12 aged girls immature with a high level of different aerobic capabilities have been showing the tendency of positive emotional state keeping in dynamic of an educational day by the mood index.

In accordance with physical working capability at the zone of submaximal power it was managed to state out that the trained children and adolescents at the critical period of development in most cases were characterized ($p<0,05$-$0,001$) with a high productivity of cognitive activity and its decreased physiological cost. It has been shown that the optimal effectiveness of intensive informational tension realization among the 6-7 and 11-12 aged testees with a well-developed anaerobic glicolitic capability is provided mainly with the account of a high speed and quality of information processing and in less degree with the account of increasing of autonomic supply activity. Along with this, the children with a high working capability at the zone of submaximal power, as a rule, differ with a low personal anxiety ($p<0,05$). It has been determined as well as “the trained” 11-12 aged girls immature are characterized with positive changes of state subjective scoring in dynamic of an educational week ($p<0,05$).

To the level of physical working capability at the zone of maximal power, another schoolchild’s FS peculiarities at the critical periods of development have been found out. It has been determined that the schoolchildren with a high level of anaerobic alactic organism’s capabilities as well as speed and speed-

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power motor capabilities as a rule are characterized with a relatively low mental working capability under intensive informative tension conditions and increased activity. Moreover, strictly expressed intergroup differences between the testees with a high and low level of anaerobic alactic capabilities are comparatively little.

Therefore, the changes of different aspects of children's FS under intensive cognitive activity depend on the working capability level at different zones of a relative power. The research results show the necessity of a tensions complex usage of aerobic and anaerobic direction in the purpose of schoolchildren's FS optimization at the critical periods of development. The obtained data are well agreed with the information published in a scientific literature. In series of works, it is shown that a high physical working capability level and regular physical exercises performing increase mental working capability, cause the improvement of academic progress (Mahar, 2006; Van Dusen, 2011; Telford, 2012; Duncan, 2013; Lees, 2013) and cause the decrease of anxiety and depression symptoms (Dunn, 2001; Crews, 2004). It is necessary to underline that in publications devoted to the analysis of physical conditions influence to FS changes under conditions of intensive cognitive activity, generally, the differences conditioned by aerobic working capability appeared at the zone of reasonable power are described (Dunn, 2001; Crews, 2004; Etnier, 2006; Voss, 2011; Krivolapchuk, 2012; Klaperski, 2013; Lees, 2013; Chaddock-Heyman, 2013; Donnelly, 2016). The information about FS peculiarities of persons varying by the working capability level appeared in another relative power zones of a relative power are numerically insignificant and contradictory (Norris, 1990; Etnier, 2006; Roemmich, 2009), and require a further specification.

7. Conclusion

The research results allow to make a conclusion that at the critical periods of development the level of physical working capability causes a great influence on schoolchildren's FS changes under the intensive cognitive activity. The obtained scientific data give the evidence of the intensive cognitive activity increase and children's FS normalization under conditions of informative-educational environment of modern school can be reached on the ground of directed and balanced improvement of physical working capability at different zones of relative power. The research results prove the opportunity of the most important pedagogical problem solving – optimization of schoolchildren's education process at the critical periods of development by means of physical education.

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