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Original Article

Efficiency of professionally applied physical preparation program and its influence on the psychophysiological function level of students studying "micro- and nanoelectronics"

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Abstract:
There are no scientific researches, now, of professionally applied physical preparation problems for new scientific and technical fields, particularly micro- and nanoelectronics as one of the main sectors of the global economy. Goal: Goal is to determine influence of professionally applied physical preparation program on the level of students experimental group psychophysiological functions and compare gathered information with the results of verification group. Experimental data: In the experimental research has took part 88 male students of "Lviv Polytechnic" fifth course. One – (n=44), and one verification group – (n= 44) was formed. General scientific theoretical and empirical research methods was used in the research. Parametric methods of Mathematical Statistics was implemented for the processing numeric arrays. Results: Reliable improvement of simple and complex visual-motor reactions, intellectual functioning, visual analyzer lability of experimental group students was observed in the research. Significant differences was determinated between experimental group and verification group experimental variables. Research proved better efficiency of author professionally applied physical preparation program in comparison with current program, in psychophysiological functions development. Conclusions: reliability performance differences of complex visual-motor reaction (CVMR) is ($p<0,001$); of simple visual-motor reaction (SVMR) is ($p<0,01$); intellectual functioning is ($p<0,05$); visual analyzer lability (VAL) is ($p<0,001$).
Keywords: micro and nanoelectronics, psychophysiological functions, students.

Introduction

Ensuring a high level of professional readiness is always the focus of many scientists defined industry sector [1-2]. However, today there is a critical situation in the students physical preparation, which is in the contradiction between the level of social demands to future professionals psychophysiological condition and students physical preparation efficiency, which is providing the ability of graduates to effectively solve the problem of professional activity [6-17].

Several researches of the national scientists indicate that today continues scientific inquiry to provide effective preparation in universities, directed to research of ways to improve students physical preparation. In particular, the issues of methods and forms of learning using various sports [9], program and normative maintenance ensuring of preparation [10], preparation technologies [13], control [12], methodical and data support [8], research of their effectiveness [7], scientific-theoretical background [6, 8] discussed, job profile diagrams of certain specialties developed [8-10].

Attempts to closely associate process of physical and mental professionals training is an important feature of some authors researches in the defined direction [1, 15, 16]. The problem of psychological principles of formation professionally important qualities become a milestone towards the development of professionals vocational training [8]. According to some authors [1, 2, 6, 14], physiological characteristics of professional activity also largely determine the preparation direction. Exploring of these features will identify sensory, motor and volition skills, physical and mental qualities, functioning and reliability levels of separate organs and systems, which are necessary for successful work.

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However, we have not met thoroughly researches, which explored the students studying on the educational direction "Micro- and nanoelectronics" quantitative psychophysiological functions changes throughout the period of study at the university. The fragmented study of the students of the designated profession physical training problem dictated the choice of research topic and have a significant theoretical and practical interest.

The mentioned defines the scientific of challenge lack of elaboration of physical preparation methodological and practical aspects in the direction "Micro- and nanoelectronics".

Material and methods

Research goal is to determine influence of professionally applied physical preparation program on the level of students experimental group psychophysiological functions and compare gathered information with the results of verification group.

Following methods of theoretical and empirical research used to achieve the formulated goals:

1. General scientific theoretical methods: analyses of the pedagogical, educational and methodical literature; comparison – for the clarification of current state of theory and practice in the physical preparation process in the technical universities; generalization – for the acquiring theoretical and empirical material.
2. Empirical: pedagogical observation; biomedical and pedagogical testing – for the diagnosis of students psychophysiological condition. Testing the level of physiological functions occurred at the end of the 5th year of study. Latent reactions periods determination of choice two of the three stimulus and simple visual-motor reaction, occurred using the device developed by professor M. Makarenko in Physiology of higher nervous activity laboratory of National Academy of Sciences of Ukraine Bogomoletz Institute of Physiology.
3. Digital array processing methods of Mathematical Statistics – or the experimental research results processing and interpretation.

88 male students of "Lviv Polytechnic" National University took part in the research. Students were distributed in 2 research groups (experimental group and verification group). Research was conducted during the 2012 2015 academic year.

Results

Author professionally applied physical preparation program technical profile students who study at educational direction "Micro- and nanoelectronics" was developed and implemented in the training process

Authoring program for technical profile students studying on the educational direction "Micro- and nanoelectronics" was developed and implemented in the training process, in the context of the previous exploratory research results [3, 4, 5] and ascertaining experiment.

When forming the program principles were considered the possibility of disharmonious influences on student's organism, such as electromagnetic field effect, chemical inputs, thermal heat and cooling, information overload etc..

The aim of author physical preparation program was to improve the efficiency of physical and functional training students of university major medical groups for ensuring a high level of psychophysical readiness of students to professional work. Experimental factor is accent development student`s professionally important physical qualities.

By the statistical analysis of test control physiological functions in the early formative stage was revealed no significant differences ($p>0,05$) between all experimental variables of students in experimental and verification groups.

So set the homogeneity of research samples for objectification conclusions about the effectiveness of the author professionally applied physical preparation program (Table 1).

Qualitative evaluation of educational experiment gives reason to believe that the use of author professionally applied physical preparation program positive impact on the development of simple visual-motor reaction of students in experimental group.

Quantitative characteristics of experimental group students increased by 23.2% from baseline after experiment. Also recorded reliable high statistical significance of obtained results ($p <0.01$), which is defined as a test scale higher than the average.

Table 1. Comparison of the indicators of psychophysiological functions of students in experimental and verification groups at the beginning and at the end of the educational experiment (n = 88).

Psychophysiological functions	At the beginning of the experiment			After the experiment		
	Experimental group (n=44) X±S	Verification group (n=44) X±S	p	Experimental group (n=44) X±S	Verification group (n=44) X±S	p
latent period of SVMR (s)	293,1± 9,74	295,4± 11,7	>0,05	225,3±10,9	251,6±14,03	<0,01
latent period of CVMR (s)	397,5±15,9	403,9± 11,4	>0,05	319,6±13,4	359,3±16,04	<0,001
VAL (scores)	40,7± 0,54	40,5± 0,58	>0,05	44,4±0,69	42,3±0,63	<0,001
Intellectual performance (number of errors)	7,8± 0,66	8,0± 0,79	>0,05	2,3±0,48	3,4±0,46	<0,05

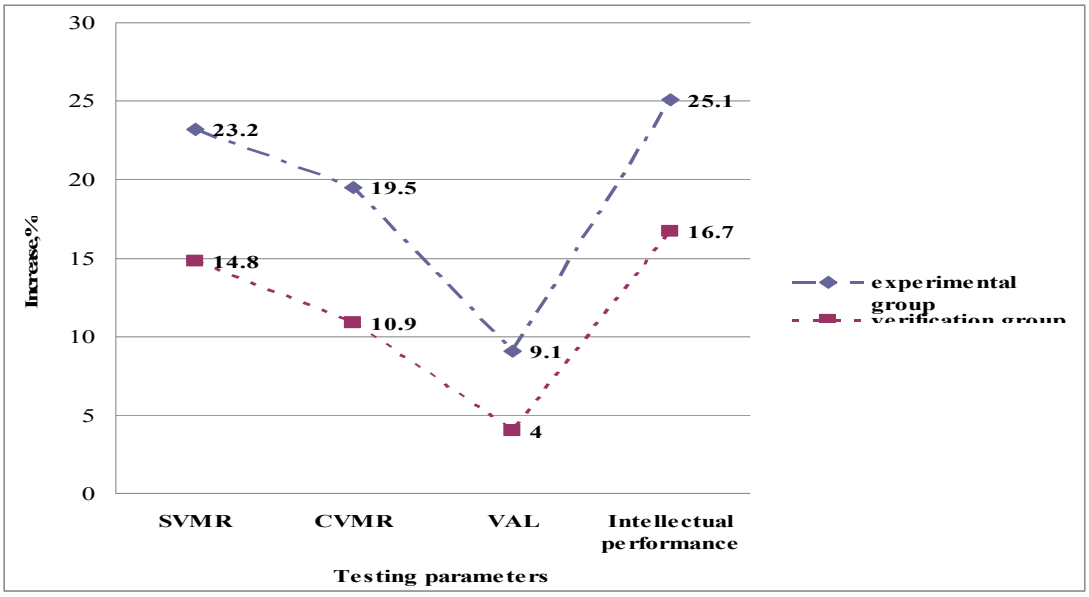

Fig. 1. Comparing the efficiency of existing program and author professionally applied physical preparation program in the psychophysiological functions development of students in experimental and verification groups, after the experimental research (n = 88).

Note: SVMR – simple visual-motor reaction, CVMR – complex visual-motor reaction, VAL – visual analyzer lability.

Setting numerical values CVMR dynamics over the course of training according to the author professionally applied physical preparation program showed that experimental group testing parameters after the fifth year was significantly higher than in the first year (+19,5 %), with a high degree of differences confidence.

Statistical treatment of tests results, which characterize the level of intellectual performance experimental group students after the experiment, established that between the output and investigational level (7,8 ± 0,66-2,3 ± 0,48) there are significant differences in the level of significance (p> 0.05). However, obtained indices by the scales of evaluation correspond to the average level.

As a result of statistical processing of the data, found that, after the experimental research, indicators of visual analyzer lability (VAL) in experimental group improved by 9.1% from baseline (Figure 1). As for changes of the same index in verification group, in this case, improving fixed at 4%, which was significantly (p<0.001) less compared to the experimental group.

Comparative analysis of all psychophysiological condition investigated parameters of experimental group students and verification group students, who worked under the current program of physical training, proved the effectiveness of author professionally applied physical preparation program compared with the current program, statistically valid is confirmed at the level of significance (p <0.05, p <0.001).

Discussion

First researched an efficiency of author professionally applied physical preparation program on the psychophysiological functions level of students studying on the educational direction "Micro- and nanoelectronics". It was established that after the experiment, all the indicators of psychophysiological functions students of experimental group were significantly better than in verification group. The most positive effect of

the use of author professionally applied physical preparation program registered in terms, which characterize level of intellectual performance and simple visual-motor reaction experimental group students. Expanded researchers information [6, 8, 12, 13] about the quantitative indicators of psychophysiological functions of technical specialties students. The results amends researches [8-10] on how to use sports in students of technical specialties professionally applied physical preparation and confirm the validity of the chosen strategy.

Conclusions

Implementation of the author professionally applied physical preparation program in the educational process of students studying on the educational direction "Micro- and nanoelectronics" allowed significantly ($p < 0.05$, $p < 0.001$) improve the level of psychophysiological functions experimental group students: simple visual-motor reaction by 23 2% complex visual-motor reaction by 19.5%; visual analyzer lability by 9.1%; and intellectual performance by 25.1%. Found that the results of testing psychophysiological functions of experimental group students after the experiment was significantly higher than in verification group. Based on the results proved the effectiveness of the author professionally applied physical preparation program and its effectiveness compared with the current program.

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