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THE PHYSIOLOGICAL CHARACTERISTIC SYSTEM CONTROL OF WORKING ACTIVITY IN THE PROCESS OF TRAINING PROSPECTIVE HEALTHCARE PROFESSIONALS

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ABSTRACT

Introduction: In this article the authors O.V. Petryshyn, E.Ya. Shapoval and S.M.Novik claim that nowadays the scientists do not pay enough attention to the development of the essential professional psychophysical qualities of a healthcare professional and do not ascertain the influence of Physical Education on personality features. That is why the study of the problem which provides the adequate level of adaptation, health strengthening and the development of professional psychophysical competence is relevant. Practical research value lies in the development of the program by the authors of the article (which is based on the authentic ideas, henceforth we further will call it as Program) and methodological support material for Physical Education course in order to have an efficient impact on systematic development of students' psychophysical qualities while using experimental diagnostic methods of estimation of perspective specialists' technical and tactical background and physical one respectively. We are speaking about the professional physical trainings for students who pursue their degree while studying at the following faculties as Medical Faculty, Pediatrician and Stomatological Faculties where sports playing technics are implemented.

The aim - is to define an effectiveness of methodology for diagnostic and estimation of perspective specialists' physical qualification.

Materials and methods: 180 students of UMSA took part in the experiment. They were divided into two groups: the experimental group (EG – 91 students) and the control group (CG – 89 students). To define the level of students' (EG) readiness index the range of the effective certificated medical biological methods were used.

Results and conclusions: The influence on general physical state index was studied during the implementation of the Program PPPT which stands for Practical Professional Physical Training. This index shows the functional state and psychophysical abilities that is important for professional activity of medical workers. The tests gave us an opportunity to diagnose individual level of physical abilities and control the effectiveness of physical education during PPPT. It is proved that Program implementation propels an improvement of each component of students' (EG) practical professional physical abilities and functional preparation as well. The effectiveness of given PPPT model was confirmed with the help of statistic changes of general functional preparation. Average index increase is by 25% in students from EG and only by 7,5% in those from CG.

KEY WORDS: higher medical education, professional preparation, psychophysical qualities, Program, diagnostic techniques

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INTRODUCTION

The scientists M.M. Bobyrieva [1], V.I. Mandrykov [2], I.Yu. Nikolaichuk [3] are studying the issue of the influence of Physical Education on medical specialists' personal development nowadays. According to the modern qualification requests the Program PPPT includes harmonic integral development of physical, moral and esthetic qualities. The main task for medical workers is to form personal psychophysical qualities on the basis of humanism, ethics, and skills for effective and caring communication with the sick in order to create the atmosphere of optimism, freshness and bravery. So, Physical Education is important not only for students to keep fit but also to develop a well-balanced qualified personality.

Physical and mental abilities of a student have the same physiological basis of support systems which are interdependent. These abilities require adaptation, physical health and the development of moving skills and knowledge. That is why the low level of psychophysical preparation can have a bad influence on the effectiveness of studying process and on the ability to be a competent specialist in medical sphere.

The main feature of modern system of training specialists in higher education institutions is characterized by the intensive process of studying and psychological strength which resulted in the lack of moving activities that consequently will lead to the bad health conditions for professional medical working activity [1].

A person in order to be successful during their working life must be a goal-targeted individual so that to achieve their aim. Actions are closely connected with physiological and psychological activity, which determine and control their actions. So, working activity is a combination of practical, physiological and psychological aspects.

Practical activity involves aspects which are dealt with the performance of a certain system of movements aimed at the changes in physical states or in properties of the working object in order to turn it into the product of working. Practical activity - involved aspect is seen as an external

(physical) side. Physiological aspect is revealed in its social nature in order to use worker's physiological functions to create social values. All organs and their systems (brain, muscles, vessels, heart, lungs etc.) are involved in the working process. While working physiological functions are being mobilized and muscles energy as well as nervous are worn out. So, the group of muscles assures working moves and actions. Their contractions are regulated by a neuronal excitation that comes to the neuronal center. A blood flow is directed to these muscles and transports nutrients, oxygen and takes back the products of decomposition which provide the energy. The intensive heart and respiratory system work enables blood circulation and metabolism. All these processes, which are connected with vital functioning of the worker's organism, are organized according to the working conditions. The bad environment can cause overextension of physiological system and pathological changes, in contrast to good one that cause productivity increasing [2, 4].

At the same time physiological processes governed by working activity keep particular independence (daily biological rhythm, speed of reaction, muscle power and endurance etc.) and special constants of vital activity (homeostasis).

Thus, the working process is a physiological process of spending human energy. A person's working potential is determined by his level of education and qualification preparation, knowledge, skills, abilities, attitude to the work, enthusiasm, activity and workability.

The worker's potential resources are not involved automatically into the action, but they are regulated by a person consciously. Personal views, motives and interests regulate his working concept. It is the working concept that forms the basis for increasing worker's competitiveness and mobility on job market, career choice and form of occupation (employment, self-employment, full, part-time etc.) [3].

During the working process a worker's tension is caused by two types of capacity: mental and muscular. The muscular capacity is revealed in the form of dynamic movements and static tension, while the nerves capacity is clear in the form of mental, emotional and sensory (on senses) loads.

A working purpose is characterized by the ratio of the muscular and nervous energy, by different performing and creative functions, by mechanical and mental operations. Each type of work is characterized by a certain level of the general employee's motor activity, which may be sufficient or insufficient (lower than the biological need for movement). Thus, favorable working conditions satisfy a human's need for motor activity, train his functional systems, develop his cognitive and communicative abilities, promote the realization of creative potential during the fulfillment of the main function as the creation of material and spiritual goods for an individual's needs and society as a whole.

The analysis of the educational qualification characteristics and PPPT Program for pursuing a degree on the faculties as Medical faculty, Pediatrician and Stomatological Faculties states the necessity to develop a widely educated personality who takes care of preserving and strengthening their own health as well as their patients and to up rise mental and physical workability of the patients. However, the study of literary sources showed that the scientists do not pay enough attention to the substantiation of a doctor's professional psychophysical qualities and do not cover the impact of Physical Education on the education and development of these qualities when the tasks of the subject Physical Education are set for the students of higher medical schools [5].

THE AIM

The aim is to define a peculiar impact of experimental diagnostic method of estimation of technical, tactical and physical preparation of future specialists at Medical, Pediatrician and Stomatological Faculties. The method is based on the implementation of sport playing techniques in the process of PPPT and its influence on students' psychophysical qualities.

MATERIALS AND METHODS

180 students of Ukrainian Medical Stomatology Academy (UMSA, Poltava, Ukraine) took part in the experiment. They were divided into two groups: experimental group (EG – 91 students) and control group (CG – 89 students). Effective certificated medical biological methods and motor tests of physical abilities were used for the diagnostic of students' (EG) preparation.

RESULTS AND DISCUSSION

Having analyzed the theory and practice of Physical Education we found out that the effectiveness of working operations depends on the physical and functional readiness of a person's body for work. Each profession requires a certain level of worker's psychophysiological potential. Thus, forming of psychophysical qualities must be one of the main tasks of qualification preparation. PPPT as a branch of Physical Education can fulfill this task. Based on the physicians' working characteristics we have set a list of requirements for future specialist's health, their physical qualities, motor skills and psychophysiological functions. These are qualities that are related to successful mastery in medical profession and they are to be developed and improved [6].

In our opinion, it is necessary to identify the key components of PPPT - the physical (biological) and psycho-physiological components of Physical Education for full understanding of the importance of the concept of PPPT for workers' health.

Physical (biological) component of Physical Education implies a person's ability to develop the physical component of his health; awareness of one's own physicality as a person's quality, ability to listen to the functioning of the organism, its systems and organs, and at the first sign of deviation from the norm fix it. For a successful professional

acting, the future specialists need to have a sufficient level of strength, endurance, flexibility, speed, and brisk performance. According to the works written by H.Vlasov, O.Zaplatin, V. Mandrykov and to our opinion as well the most important quality of a perspective doctor is his physical endurance, which implies a low level of tiredness and fatigue but a high level of workability. Coordination and muscle sensitivity are also important due to the specifics of the doctors' professional activity: a working day with long hours (night long hours and unscheduled duties);serious workload (difficult work of ambulance workers, doctors of the Ministry of Emergencies, family and district doctors, medical workers in rural areas, hours of tedious surgery, first medical aid, transportation of patients or victims, accuracy of movements and muscular coordination (important to the work of vertebrologists, anesthesiologists, cardiologists and neurosurgeons, obstetricians, traumatologists and orthopedists)).

Psychophysiological component of Physical Education depends on the functional state of the brain; it is characterized by the level and quality of mental ability, the development of attention and memory, the degree of emotional stability, the development of volitional qualities. As it is known, in medicine, the human factor is critical, therefore doctor's psychophysiological features, psycho-physiological self-analysis, optimization of functional states that manifest in professional activities, have a crucial effect on the quality of work and as a result patients' health and life. In addition, the psycho-physiological component contributes to solving the tasks of professional specialization and suitability for a particular sphere of medical activity as well as to identifying and forming important psychological qualities for professional activity.

In our opinion, this fact mentioned above will promote more effective production activity, increase general efficiency, rise health level and prevent professional diseases. Therefore, PPPT course involves the development of appropriate knowledge and skills which are necessary for specialists' practice [7]. For medical universities, the main task of professional Physical Education is to make students take care of their physical form, show more autonomy and activity even at the stage of admission to higher educational institutions as well as during their study period. In our opinion the most relevant issue is to define an effectiveness of the diagnostic method for assessing future specialists' technical, tactical and physical readiness. The problem of professional physical preparation diagnostics is solved only partially because of the quantity of existing occupations, their dynamic upgrade and the lack of researches of the issue in the scientific literature. However some indicative standards have already been included into the corresponding official programs of the PPPT.

We have developed a structural and functional PPPT model on the basis of the research of national and foreign scientists and on the analysis of scientific pedagogical literature. The structural-functional model contains the following components: targeting, theoretical-methodological, content, organizational (procedural); diagnostic. The last one has a great importance for our study, because it determines the development of qualities that provide the PPPT of future specialists (value-motivational, cognitive-informational, operational-active, professional-reflexive), evaluation criteria and levels of formation of these components.

The diagnostic component of the developed model contains the necessary diagnostic tools for checking the quality of PPPT of students in the process of mastering their specialty. They are as following : criteria, indicators, levels.

It should be noted that pedagogical and psychological science has different views on the criteria for evaluating the physical readiness of future specialists for professional activity. In the process of formation of a future specialist, PPPT has a great impact on the formation of his character, set of values, the development of the student's motivational and emotional spheres. At the same time, its main task is to form the specialists' physical potential of a particular kind of professional activity [8].

The system approach to the study of the physiological and psychological patterns of the employee's working activity involves the application of such methods of research as physiological, psychological, statistical, mathematical, etc. In our research the main method is a physiological one that is used to study the functional state of the worker and evaluate body systems' reaction on a specific job load [9].

According to this method, we were able to determine the level of formation of so-called operative dynamic stereotype.

The operative dynamic stereotypes of individual professions have different structures. The ratio of reflexes and the interaction of body functions cause these differences. This is because of the vegetative functions and their changes that provide the activity of the whole organism and the implementation of the dynamic stereotype. Theformation of the operative dynamic stereotype leads to a particular automatization of the worker's action due to the establishment of temporal connections between neuronal centers. The automatic action facilitates the work and frees neurons for creative activity, promotes their workability and productivity.

Physiological principles of rationalization of working movements are the basis of the development of rational working processes, operations and techniques. To do this, worker selects the workplace, which corresponds to the nature of the working, worker's physiological and anthropometrical peculiarities, determines stability of the standing and sitting position, inclination and turns of the body and the head, the static tension, the convenience and safety of the work; the trajectories and the distance of work units movement, the speed of movements and the possibility to replace one motion by another one, the possibility of combining movements, the tempo and the rhythm of work [10].

The most common physiological method includes the methods for investigating the functional state of the central neuronal system, the motor apparatus, muscular strength and endurance, respiration, the state of the car-

Table I. Students' functional state index (EG and CG before and after the experiment)

Physical abilities	Before the experiment		p	After the experiment		p
	EG(n=40)	CG(n=40)		EG(n=40)	CG(n=40)	
	X±S	X±S		X±S	X±S	
Endurance(c)	248,6±6,3	244,7±5,3	>0,05	201,4±6,72	233,7±5,35	<0,01
Coordination (c)	10,2±0,16	10,4±0,18	>0,05	8,4±0,14	9,2±0,15	<0,05
Speed(c)	15,1± 0,17	15,3± 0,13	>0,05	13,7±0,13	14,2±0,15	<0,05
Balance(c)	39,6± 2,16	38,1± 1,48	>0,05	54,8±1,78	41,1±2,23	<0,001
Hand coordination(c)	10,7±0,54	10,8± 0,88	>0,05	8,1±0,59	9,7±0,63	<0,05
Power endurance(c)	33,9±,84	34,7± 1,39	>0,05	47,6±1,72	40,1±1,7	<0,001
Static power endurance(c)	32,6±1,40	32,3± 1,64	>0,05	45,1±1,34	39,7±1,67	<0,001
Speed and power(м)	6,0±0,36	6,1± 0,35	>0,05	7,2±0,29	6,7±0,32	<0,05

diovascular system, analyzers. We have used the method for measuring the latent time of reflex reactions to evaluate the functional state of the neuronal system. One of these techniques is sensorimotor analysatory reflexometry. In this case, the time of the simple reaction or the time of the recognition and selection of the reaction can be studied. When increasing the reaction time decreasing in efficiency is indicated.

We studied the motor apparatus of the worker using the methods of tremometry, coordinator metry, dynamometry, ergography, etc. Muscle tremor has been considered as an index of tiredness.

We have used dynamometry to determine the strength and endurance of the individual muscle groups. To register the fulfillment of a particular piece of physical work by the individual motor units before the sense of tiredness the following ergographs (wrists, shoulders, etc.) have been used. The ergographs make it possible to record the graph of worker's muscular tiredness.

We have studied the state of the students' cardiovascular system using pulsometry and measuring blood pressure. The functional state of an employee's respiratory organs has been studied by methods of pneumography and spirometry. With the help of pneumograph respiratory movements of the chest have been recorded and by the spirometer the respiratory volume and the vital capacity of the lungs have been measured. With such data, the minute volume of breath has been calculated. The changes in frequency and depth of breathing were the signals of physical work intensity [11].

Effective research of the employee's functional state, his workability, tiredness and professional suitability can be provided with a combination of different methods of research. That is confirmed by the data in the table I.

The statistical analysis of the testing results of the functional state of EG students who followed the Program, shows that there are positive changes in the quantitative parameters of their indexes, the probability of differences between them is reliable (p <0.05-p <0.001). The reliability of the differences between the final functional state indexes of the EG and the CG for the benefit of the first ones has also been proved and statistically verified.

The difference (p<0,05-0,001) between the initial and final indexes of students' professional qualities development is confirmed. It is worth mentioning that the following parameters as the speed and power abilities, the static power endurance, power endurance, hand coordination, body balance were under consideration. The growth of the EG students' indexes mentioned above was at the level from 9 to 28% with the reliability of the differences (p <0,05 - 0,001).

The perfection of working skills (operative dynamic stereotype) has been evaluated by the means of quantitative and qualitative indexes of work, as well as by such physiological indicators:

- the stability of the skills which are characterized by the variability of the time spent on work performance, the amplitude and length of the trajectory of movements;
- the concentration on the neuronal processes when the developed reflexes are formed only in response to the stimuli of a certain quality and do not occur to stimuli that have different signal meaning.

The research does not cover all the aspects of the problem given. The issue of the development of the following method which could improve women's organisms with the assistance of modern technologies (based on the research conducted on Medical Faculty students) and the further comparison of these results with the results based on the research conducted on the female students of pedagogical universities could be considered as the perspective for further investigation.

CONCLUSIONS

It is proved that Program implementation propels an improvement of each component of students' (EG) practical professional physical abilities and functional preparation as well. The effectiveness of given PPPT model was confirmed with the help of statistic changes of general functional preparation. Average index increase is by 25% in students from EG and only by 7,5% in those from CG.

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