ISSN 0798 1015

REVISTA ESPACIOS

HOME Revista ESPACIOS ÍNDICES / Index A LOS AUTORES / To the AUTORS

EDUCACIÓN • EDUCAÇÃO • EDUCATION Vol. 41 (Number 02) Year 2020. Page 3

Professional-applied physical training of future HR specialists

Entrenamiento físico profesional aplicado a futuros especialistas en RR.HH.

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Received: 20/06/2019 • Approved: 25/11/2019 • Published 31/01/2020

Contents

ABSTRACT:
This article considers the issue of improvement of physical training at the Department of Physical Education of the Moscow Aviation Institute (National Research University) through the introduction of a block of professional-applied orientation into the educational process. The paper presents a modernized block of formation of professional-applied physical qualities of future specialists in personnel management, including a complex of physical exercises aimed at active traction-rotational muscle relaxation of the paravertebral muscles of the cervical thoracic spine, which contributes to the improvement of students' performance. Throughout the document it is shown that the use of traction exercises has a pronounced chronotropic effect on the heart, increases the level of neuro-muscular regulation, promotes the development of strength and overall endurance. The results of the study serve as actual material for the development and implementation of professional-applied physical training programs for future specialists in personnel management.
Keywords: professionally important qualities, professional-applied physical training, personnel management, students.

RESUMEN:
Este artículo aborda la cuestión de la mejora de la preparación física en el Departamento de Educación Física del Instituto de Aviación de Moscú (Universidad Nacional de Investigación) mediante la introducción de un bloque de orientación aplicada profesionalmente en el proceso educativo. El trabajo presenta un bloque modernizado de formación de las cualidades físicas aplicadas profesionalmente de los futuros especialistas en gestión de personal, incluyendo un complejo de ejercicios físicos dirigidos a la tracción rotacional activa para la relajación de los músculos paravertebrales de la columna torácica cervical, lo que contribuye a la mejora del rendimiento de los alumnos. A lo largo del documento se demuestra que el uso de ejercicios de tracción tiene un efecto cronotrópico pronunciado en el corazón, aumenta el nivel de regulación neuromuscular, promueve el desarrollo de la fuerza y la resistencia en general. Los resultados del estudio sirven como material real para el desarrollo e implementación de programas de entrenamiento físico aplicados profesionalmente para futuros especialistas en gestión de personal.
Palabras clave: cualidades profesionales importantes

1. Introduction

One of the leading trends in the development of the modern educational situation, taking place against the backdrop of dramatic changes in the socio-economic sphere of our society, is the increased attention to the formation of human resources potential of a qualitatively new level.

In order to ensure the successful recovery of the Russian economy from the crisis and to prevent a slowdown in its development, the government is taking a number of measures, the list of which includes tasks aimed at intensifying the growth of the level of all industrial relations. They can be solved by improving the quality of professional training of labor force, as well as by increasing the number of much-needed high-performance jobs (MNHPJ).

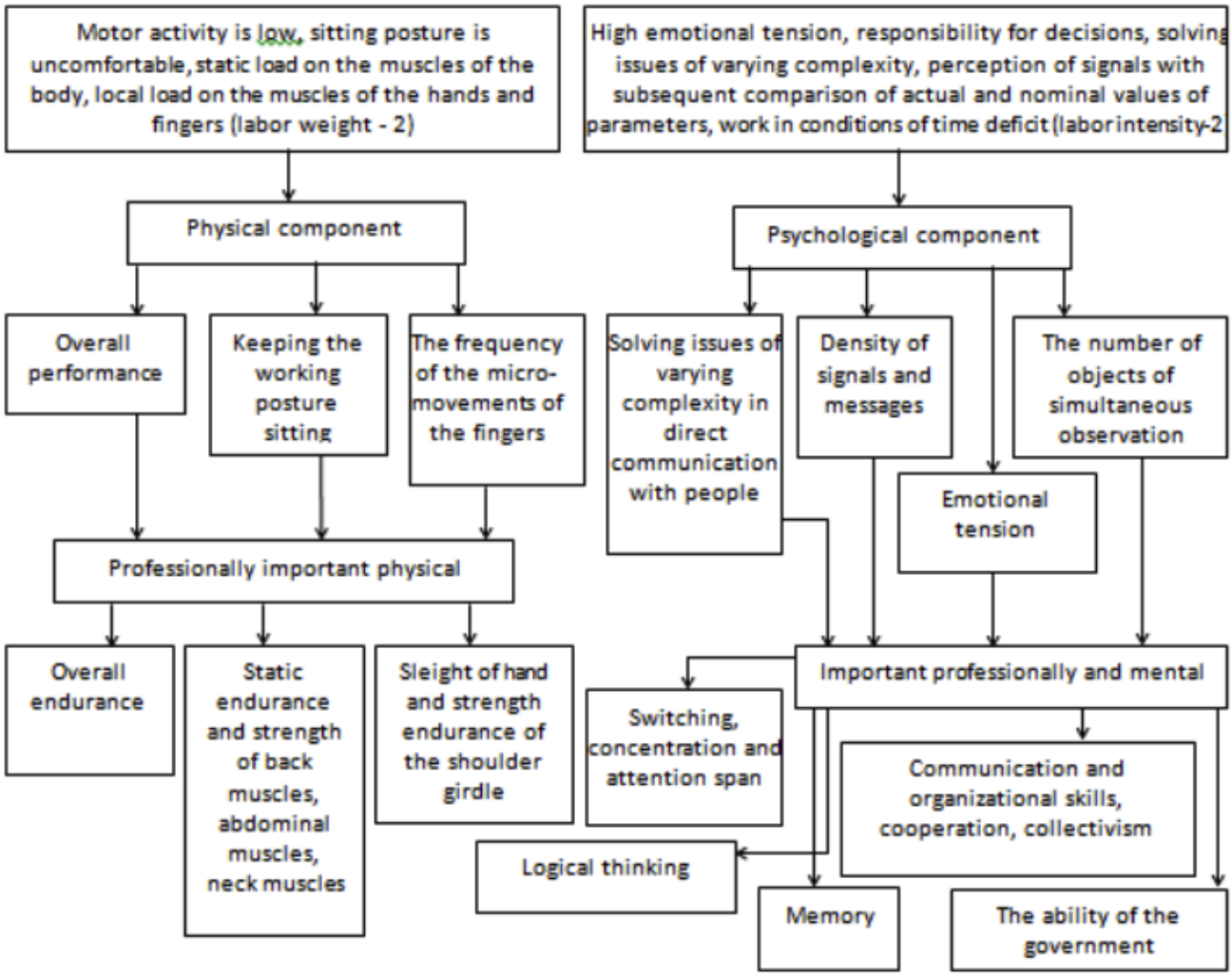
2. Methodology

When announcing vacancies for the MNHPJ, many organizations and industrial production facilities impose requirements on potential employees to have relevant professionally important psychophysiological qualities (RPIPQ). Thus, the special attention is paid to physical and functional parameters of future workers. It is believed that a person's professional ability to work, which is based on special knowledge, skills, abilities and a certain set of professionally significant physical and mental qualities, influences labor productivity (Fedotova, Tikhonov, Novikov, 2018). An inverse relationship has also been found when the profession influences a person by forming quite different "psychophysiological portraits" (Sadovskaya, Golubova, Tarabrina, 2006; Tarabrina, 2015). For example, medical, legal, or economic influence on a person is multifaceted; some subjects manifest themselves as harmoniously managed, empathic, and others as impulsive, emotionally unstable, and frustrating. Depending on the peculiarities of professional activity, there is a variable frequency of occurrence of various types of influence.

It is becoming obvious that the problems of professional selection, with rather stringent modern requirements, are not only of great importance, but can also have a crucial relevance for employers and for the hired specialist. The problem of selection of specialists with certain RPIPQ arises not only for institutions and organizations offering MNHPJ, but also for higher education institutions that train future specialists (Zheltenkov, Fedotova, Tikhonov, 2018; Sadovskaya, Golubova, Tarabrina, 2006; Tarabrina, 2015).

The solution to this problem is seen in the physical education of students, and more precisely in their professional and applied physical training (PAPT). The main task of PAPT in the university is to form the students of RPIPQ and physical qualities in order to reduce the time of adaptation at the workplace and increase the resistance of the organism to the workloads of the chosen profession, contributing to successfully master it (Zheltenkov, Fedotova, Tikhonov, 2018).

Figure 1
Features of labor activity defining professionally applied physical training of students and future HR specialists (Emmert M.S., 2011)



Research from M.S. Emmert (2004) and A.V. Gusev (2017) shows that the professionally important qualities of a human resources specialist should include general endurance (as for most professions, because it determines the level of performance of the specialist, and therefore their fatigue), static and dynamic strength of the "knowledge" muscles (back, abdominal press, shoulder belt), dexterity of the hand muscles, communication and organizational skills, attention shifting, logical thinking, operational memory and the ability to self-management (stress tolerance) (Figure 1) (Emmert, 2014).

Conventionally, these qualities were combined into three groups: physical, mental and personal.

A number of studies have shown that a human resources specialist devotes a lot of time to working at the computer, while spending most of his working time (up to 55%) in an uncomfortable position "sitting at the table" (Kraev, Semina, 2017; Tarabrina, 2016). Long sitting position makes it difficult for diaphragmatic breathing, promotes stagnation of blood in the lower limbs, pelvic organs, increases the axial load on the spine. Constant muscle overexertion leads to a worsening of blood circulation in the muscles surrounding the spine, shoulder belt and joints of the upper limbs. As a result, their nutrition deteriorates and microtraumatization occurs, which leads to the development of hypertension, and, as a consequence, the disruption of spine activity. In the presence of an existing spinal disease, it can cause progression, or the development of new disorders of the musculoskeletal system.

Currently, much attention is paid to the creation of health complexes reducing muscle hypertonicity based on physical exertion of symmetric and asymmetric nature, as well as swimming with the use of aids for the weighting of various muscle groups (Tarabrina, 2016). However, most of them are complicated in their execution and provide expensive equipment and constant control of the teacher.

At the present stage, one of the most effective methods of correction of musculoskeletal disorders is tractors. A number of studies have shown that the traction of mesodermal formations of the cervical-collar zone, carried out by different methods, leads to a decrease in sympathetic effects on heart performance (Podverbniy, Kraev, Tikhonov, 2017; Tikhonov, Stroev, 2017), an increase in oxygen content in the limb tissues and an improvement in the respiratory system (Sadovskaya, Golubova, Tarabrina, 2006; Tarabrina, 2016), which generally increases the level of performance.

N.Y. Tarabrina (2015, 2016) and her co-authors showed that active tractor myorelaxation has a positive effect on coordination and agility, as well as a sedative effect on the central nervous system activity, which is manifested in the tendency to increase the tension of low-frequency and decrease the intensity of high-frequency rhythms in the electrical activity of the brain. The authors concluded that the basis for the detected cardio-vascular and respiratory effects at different stages of the oxygen cascade is the harmonization of myotonus in the projection areas of the spinal segments C3-Th8 and the normalization of muscle afferences in the chains of myo-cardial, myo-vascular and myo-respiratory reflexes (Tarabrina, 2016). The example of a complex of traction and rotation exercises is presented in the Figure 2.

Figure 2
Approximate set of exercises by the method of traction-rotational muscle relaxation (according to N.Yu. Tarabrina, 2016): a - traction exercise; b - rotation exercise

It is logical to suppose that the inclusion in the block of professional applied physical training (PAPT) of students and future specialists in human resources management, methods of traction myorelaxation will increase the level of overall performance and static stamina of the upper arm belt muscles, having a positive impact on the development of local dynamic endurance of small groups of hand muscles and stress resistance.

The purpose of the article is to study the influence of the method of active traction muscle relaxation in the framework of professional and applied physical training on the development of professionally important psychophysiological qualities and physical performance of future HR specialists.

3. Material and methods

The pilot study was conducted in Moscow Aviation Institute (National Research University) in Moscow.

Fifty students of 1-3 years of education (17-25 years old) from the specialty «HR», from the «Engineering Economics and Humanities» department participated in it. All people were divided into two functional groups. The control group (CG) had 20 students and was engaged in the program of general physical training (GPT). Classes in the experimental group (EG) (30 persons) were conducted with GPT, with the additional use of physical exercises for the formation of

professionally applied physical important qualities of future HR specialists. It includes a set of physical exercises for an active traction-rotational muscle relaxation of paravertebral muscles of the cervical-thoracic spine (C3-Th8 segments) (Tarabrina, 2016). At the beginning and at the end of the school year, with the help of the medical diagnostic hardware-software complex «Bio Mouse Research» (LLC «NeuroLab», Russia). The overall performance was determined by the PWC170 test. Calculations and graphic design of the data obtained in the work were carried out using Microsoft Excel and the software package "STATISTICA – 10.0". Paired comparison of groups was performed using a parametric Student test. In this case, the arithmetic mean (A) was used as a measure of the central tendency, and the standard error of the arithmetic mean (SE) was used as a scattering measure.

4. Results and discussion

As a result of the research with GPT in CG and the exercises of professional and applied orientation in EG we have identified multidirectional changes.

In terms of autonomic regulation of heart rate, nine of the fourteen indicators were changed in CG (Table 1). Heart rate increased by 40.17% ($p<0.05$), average duration of intervals between heart contractions, reflecting the total effect of sympathetic and parasympathetic influences on sinus rhythm decreased by 25.39% ($p<0.05$), Mode (Mo - range of the most common values of cardio intervals) decreased almost twice, and the amplitude of the mode (AMO) increased by 49.43% ($p<0.001$). At the same time, there is a decrease in the level of functionality of the cardiovascular system by 31.64% ($p<0.05$), the stress index and the psychophysiological value increase three to four times. Such changes indicate a problem of adaptation, which in our opinion indicates an increase in vegetative signs of stress (in particular, information stress).

GPT has insufficient positive effect on the heart. Stress resulting from intense learning activity leads to the formation of functional changes that can lead to a violation of the interaction between regulatory systems and the formation of dysregulatory pathology or "adaptation diseases", which are based on the lack of adaptive reserves of the body (Sadovskaya, Golubova, Tarabrina, 2006). Students from EG suffered the decrease in the activity of the sympathetic division of the autonomic nervous system (ANS), which was expressed in a decrease in the mean values of the amplitude of the mode by 4,84% ($p<0,05$), the stress index and "psychophysiological value" decreased almost twice in comparison with the CG, while the decrease in the level of functionality of the cardiovascular system compared to the CG is leveled. Indicators reflecting the activity of the parasympathetic division of the autonomic nervous system, such as SDNN (standard deviation of all normal (sinus, NN) intervals from the average value) and HF (power of high-frequency waves), characterizing the adaptive capabilities of the cardiovascular system, on the contrary increased by 40.7% and 12.7% ($p <0.05$), respectively (Table 1).

In general, it can be concluded that the state of stress of neurohumoral mechanisms of self-regulation with the mobilization of functional resources and instability of homeostasis indicators, which leads to a decrease in the stock of functional reserves and significantly narrows the range of possible adaptive reactions, is typical for students of CG.

Parameters of the arterial system of students using PAPT show the dynamics of the transformation of the ANS during the classes (Tarabrina, 2016).

The use of the PAPT in the training process leads to the optimization of the ratio of centrality and autonomy in the regulation of cardiac activity and the development of a stable balance of the components of the ANS.

Table 1
Characteristics of heart rate variability of students in the CG (n=20) and EG (n=30), M±m

Parameters (unit of measure)	Control Group (n=20)			Experimental Group (n=30)		
	before	after	Δ%	before	after	Δ%
Heart rate, bpm.	54,76±4,84	76,76±7,77	40,17*	79,87±5,66	80,99±4,55	1,40*
RRNN, мs	1150,07±77,65	858,01±96,49	-25,39*	796,63±92,50	759,28±47,80	-4,68*

MxDMn, мс	334,05±28,83	225,57±35,02	-32,47*	245,66±15,83	259,99±29,98	5,83*
SDNN, мс	106,01±16,33	57,53±13,07	-45,73	55,43±3,16	58,22±11,66	5,03
CV, %	9,24±1,24	6,46±0,97	-3,08	7,50±0,80	7,31±0,93	-2,53*
Mo, мс	1236,11±91,20	863,88±102,66	-99,20*	793,75±99,52	750,00±34,06	-5,51
AMo, %	29,96±2,89	44,77±4,50	49,43 ***	39,02±3,68	40,91±4,91	4,84*
LFCS, standard unit	4,55±0,29	3,11±0,53	-31,64*	3,12±0,29	2,87±0,35	-8,01*
LTCS, standard unit	4,55±0,17	3,11±0,45	-31,64*	3,62±0,18	3,37±0,32	-6,90**
PV, standard unit	342,11±80,9	1725,55± 500,68	404,38*	937,62±111,60	1444,00±465,7	54,00**
VI, standard unit	43,55±7,86	194,00±56,33	345,46*	103,50±4,49	137,12±42,48	32,48**
HF, %	44,28±7,51	42,21±10,59	-4,67	46,77±6,80	50,28±7,41	7,50**
LF, %	44,37±7,52	35,12±9,59	-27,54	53,22±6,80	49,71±7,41	-6,59
LF/HF, %	4,45±3,17	1,12±0,29	-74,83	1,57±0,49	1,25±0,27	-20,38

RRNN is the average duration of RR intervals; MxDMn is the variational range; SDNN is the standard deviation; CV is the coefficient of variation; Mo is the mode; AMo is the amplitude of the mode; LFCS is a level of functionality of the cardiovascular system, LTCS is a level of tension of the cardiovascular system, PV is a psychophysiological value, VI is a voltage index; * – p – is a reliability of differences in indicators relative to the baseline; * – p <0,05; ** – p <0,01; *** – p <0,001, T is a Student criterion; Δ% is a difference between the relative values of the parameter.

Studies of neuromuscular motility parameters of students indicate a positive effect of PAPT to increase the level of both simple and complex visual-motor reactions. On the table 2 we can see that all the studied indicators have growth dynamics, but the difference is more significant for EG students.

Table 2
The level of neuromuscular motor skills of students of CG (n=20) and EG (n=30), M±m

Parameters (unit of measure)	**CG**			**EG**		
	before	**after**	**Δ%**	**before**	**after**	**Δ%**
SVMR, мс	232,57±2,71	223,63±3,84	-3,84*	238,62±2,18	195,12±3,86	-18,22*
CVMR, мс	392,57±13,22	387,48±12,1	-1,29	402,65±10,25	375,14±10,1	-6,83*
RMO, мс	18,37±2,83	10,23±3,02	-44,3*	18,25±2,65	9,25±2,02	-49,31*

SVMR is a simple visual-motor reaction; CVMR is a complex visual-motor reaction; RMO is a reaction to a moving object; P is a reliability of differences in indicators relative to the baseline; *

– p <0,05; t is a Student criterion; Δ, % is a difference between the relative values of the parameter.

The most dramatic changes showed in the table 2 are observed in the response to a moving object: 49,31% (p<0,05), the difference in indicators of simple and complex motor reaction was 14,38% and 5,54% (p<0,05) respectively. It is believed that the speed capabilities of a person (reflected in this indicator), especially in their motor part, are more innate and change under the influence of training only a little bit: They decrease with age (starting with adulthood). However, the data obtained earlier in our studies suggests that the use of PAPT in the educational process leads to more coordinated work of intramuscular and intermuscular coordination, normalization of proprioceptive afferentation.

It is known that the ability to perform repetitive high-intensity actions for a long period of time in combination with good aerobic ability are physiological requirements for success in professional activities.

Analyzing the results, we note that for all studied indicators of overall performance by the end of the school year there is a decrease in both absolute and relative values of performance indicators (PWC170) and maximum oxygen consumption (MOC) from 5,48 to 8,34% (p<0,05-0,01) in CG (Table 3).

Effects of exercises from PAPT manifested in a significant increase of the indicators PWC170 and MOC compared to background values. Thus, the average values of absolute and relative values PWC170, recorded under the action of exercises professionally-applied orientation, compared with the background values exceeded by 11,63 % (p<0,001) and 11,91 % (p<0,001) respectively, absolute and relative MOC by 7,68 and 7,86 % (p<0,001) respectively.

Thus, the change of sign observed in the EG in the students' performance show more things than if we compare its effect with the action of the GFT.

Table 3
Indicators of the students' health of
CG (n=20) and EG (n=30), M± m

Parameters	Indicators					
	Control Group			Experimental Group		
	before	after	Δ%	before	after	Δ%
PWC170 (kg/min).	1420.16±64.17	1302.46±61.24	-8.29***	1421.13±63.15	1585.28±92.90	11.63***
PWC170 (kg/min/kg)	21.44±2.56	19.65±2.27	-8.34***	20.43±2.66	23.99±3.42	11.91***
MOC (l/min)	3654.27±109.09	3454.18±104.12	-5.48***	3665.37±108.0	3934.98±157.93	7.68***
MOC/кг (l/min/kg)	55.22±6.83	52.19±6.33	-5.50***	54.23±5.74	59.56±8.21	7.86***

PWC170 is an absolute measure of physical performance; PWC170/kg is a physical performance indicator related to body weight; MOC is a maximal oxygen consumption; MOC/kg, is a maximal oxygen consumption related to body weight; Δ% is a difference between the relative values of the parameter.

To control the level of development of the general power potential of students we used the integral index of relative force (IIRF), which characterizes the general model characteristic of general power readiness.

In the table 4 we can see that the students of control group on individual indicators all the studied parameters are much higher than of the students of experimental group. So leg strength F1 has 175,0±1,98 kg, hand strength F2 has 145,0±0,94 kg, back strength F3 has 225,35±0,85 kg, hand dynamometry of the right and left hands (F4 and F5) has 68,0±0,86 kg and 63,5±0,78 kg respectively. In control group F1 has 123,75±2,05 kg, F2 has 100,0±1,04 kg, F3 has

156,25±2,09 kg, hand dynamometry (F4 and F5) has 58,0±0,85 kg and 57,37±065 kg respectively.

Table 4
Integral indicators of the relative strength of students of CG (n=20) and EG (n=30), M±m

Group	IIRF, unit of measure	F1	F2	F3	Hand dynamometry	
					F4	F5
CG	3,62± 0,1	175,0± 1,98	145,0± 0,94	225,35± 0,85	68,0± 0,86	63,5± 0,78
EG	6,12± 0,3	123,75± 2,05	100,0± 1,04	156,25± 2,09	58,0± 0,85	51,25± 0,76
Δ%	69,06*	29,28*	31,03*	30,66*	14,7*	19,29*

IIRF – integral index of relative force, F1 is a strength of the legs, F2 is a strength of the arms, F3 is a back strength, F4 is a hand dynamometry of a right hand, F5 is a hand dynamometry of a left hand; * – p <0,05; t is a Student criterion; Δ, % is a difference between the relative values of the parameter.

Integral indicators of relative strength of the students of EG are superior in power indicators than the students from CG. IIRF has 6,12±0,3 in EG and in CG it has 3,62±0,1. It is known that the higher the coefficient of IIRF, the higher the power potential of a person.

Thus, the refined block of formation and development of professional and applied physical qualities of EG students contributed to the formation of their integral structure of the whole complex of RPIPQ, which provided an increase in the efficiency of their development of the profession to perform professional tasks.

5. Conclusions

1. It was shown that the use of traction exercises has a pronounced chronotropic effect on heart function, which was manifested in a decrease in the mode amplitude by 4.84% ($p < 0.05$), as well as in the "stress index" and "psychophysiological price" practically two times ($p < 0.001$). Indicators reflecting the activity of the parasympathetic department of the autonomic nervous system and characterizing the adaptive capabilities of the cardiovascular system, on the contrary, increased by 40.7% and 12.7% ($p < 0.05$), respectively.

2. It was determined that the harmonization of muscle tone of the cervicothoracic spine increases the level of neuro-muscular regulation and proprioceptive afferentation. The speed of a simple and complex motor reaction increases by 18.22% and 6.83% ($p < 0.05$), respectively, and the integral indicator of power capabilities by 69.06% ($p < 0.05$). At the same time, the ability to operator activity increases by 49.31% ($p < 0.05$).

3. The introduction of a professionally applied unit into the educational process statistically significantly increases the overall physical performance and maximum oxygen consumption of the body by 11.63% and 7.68% ($p < 0.001$), respectively, which is associated with optimization of the functional activity of the sympathetic and parasympathetic vegetative sections nervous system, regulating the work of the cardiovascular and respiratory systems.

Bibliographic references

Emmert M. S. (2014). Assessment of efficiency of development of professionally significant qualities of future specialists in personnel management. *Omsk scientific Bulletin*.5(132), 177-178.

Fedotova M.A., Tikhonov A.I., Novikov S.V. (2018). Estimating the effectiveness of personnel management at aviation enterprises. *Russian Engineering Research.* 38(6), 466-468.

Kraev Yu.V., Semina A.P. (2017). An overview of the types of aggression in human resources. *Moscow economic journal.* 4, 70.

Mikhailov A.A., Fedotova M.A., Tikhonov A.I., Novikov S.V. (2018). Problems of professional self-determination of students. *Financial economics.* 6, 206-210.

Podverbnyj O.E., Kraev V.M., Tikhonov A.I. (2017). Modern management education of engineering personnel. *Siberian journal of science and technology.* 18(4), 976-980.

Prosvirina N.V., Tikhonov A.I., Novikov S.V. (2018). Education of students in the context of cultural development. *Moscow economic journal*. 3, 19.

Sadovskaya Yu.Ya., Golubova T.N., Tarabrina N.Yu. (2006). Dynamics of psychophysiological functions of students in the learning process. *Pedagogy, psychology and medico-biological problems of physical education and sport.* 1, 135-138.

Tarabrina N.Yu. (2015). Psychophysiological assessment of the health of law students. *Theory and practice of physical culture.* 1, 52-54.

Tarabrina N.Yu. (2016). Muscle relaxation in the system of correction of scoliotic changes in the cervical-thoracic spine of athletes. *Theory and practice of physical culture.* 4, 30-32.

Tikhonov A I., Stroev V.V. (2017). New approaches to the training of engineering and management personnel. *Bulletin of the University (State University of management).* 12, 28-32.

Zheltenkov A.V., Fedotova M.A., Tikhonov A.I. (2018). Analysis of the quality of professional training of personnel management specialists in higher educational institutions. *Bulletin of the Moscow state regional University.* 2, 61-70.

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Revista ESPACIOS. ISSN 0798 1015
Vol. 41 (Nº 02) Year 2020

[Index]

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