Comparative characteristics of the functional state of future art teachers and other pedagogical specialties students

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Abstract

Purpose: to reveal the autonomic regulation peculiarities of the functional state based on indicators of the nervous and cardiovascular systems work of future fine arts and music teachers for the development of recommendations for the use of physical exercises.

Material and methods
812 students of pedagogical institutions of higher education of Ukraine took part in the study. During psychophysiological testing, the following indicators were determined for each test: reaction time, number of errors. The shorter the reaction time, the higher the mobility of nervous processes. The lower the number of errors in the reaction test of choosing two elements out of three, the higher the stability of nervous processes. Orthostatic reactions were determined by the results of heart rate in the lying position and in the standing position. Parametric processing methods (Student’s method for comparing average values) and hierarchical cluster analysis were used.

Results
Two groups of students - future teachers were identified: with a predominance of the sympathetic department of the autonomic nervous system and with a predominance of the parasympathetic department of the autonomic nervous system. The largest number of students with predominance of the parasympathetic department of the autonomic nervous system was found among students – future teachers of creative specialties (faculty of arts). Students of the Faculty of Arts have significantly longer latency time of visual-motor reaction compared to representatives of other faculties. This indicates a lower mobility of nervous processes of students of the Faculty of Arts in comparison with students of other faculties. Along with this, future art teachers have significantly fewer errors in the test for choosing 2 elements out of 3. This indicates greater stability of nervous processes in future teachers – representatives of art compared to other future teachers.

Conclusions
Students – future teachers of creative specialties (faculty of arts) have the more stability and less mobility nervous system in combination with the autonomic nervous system parasympathetic department predominance. That is why endurance exercises that do not require frequent switching of attention are suitable for them. Such exercises include walking, slow running, swimming et. all. Exercises should be performed for at least one hour. They will also be suitable for exercises with the activation of visual perception.

Key words: art, students, psychophysiological indicators, orthostatic test, nervous system
Анотація
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Проаналізована характеристика функціонального стану майбутніх викладачів мистецтва та студентів інших педагогічних спеціальностей.
Мета: виявити особливості вегетативної регуляції функціонального стану на основі показників роботи нервової і середовищної систем майбутніх викладачів з образотворчого мистецтва і музики для розробки рекомендацій щодо застосування фізичних вправ.
Матеріал і методи
В дослідженні взяли участь 812 студентів педагогічних університетів України. При психофізіологічному тестуванні за кожним тестом визначались наступні показники: час реакції, кількість помилок. Чим менше час реакції, тим вища рухливість нервових процесів. Чим менша кількість помилок в тесті реакції вибіру двох елементів з трьох, тим вища спектральна та стійкість нервових процесів. Ортостатичні реакції визначалися за результатами ЧСС в положенні лежачі та в положенні стоячі. Застосовувались параметричні методи обробки (метод Стьюдента для порівняння середніх значень) та ієрархічний кластерний аналіз.
Результати
Виявлено дві групи студентів – майбутніх педагогів: з переважанням симпатичного відділу вегетативної нервової системи та з переважанням парасимпатичного відділу вегетативної нервової системи. Найбільша кількість студентів з переважанням парасимпатичного відділу вегетативної нервової системи виявлена серед студентів – майбутніх педагогів творчих спеціальностей (факультет мистецтв). У студентів факультету мистецтв достовірно більшій латентний час зорово-моторної реакції у порівнянні з представниками інших факультетів. Це свідчить про більшу рухливість нервових процесів студентів факультету мистецтв у порівнянні зі студентами інших факультетів. Разом з цим у майбутніх викладачів мистецтва достовірно менша кількість помилок в тесті на вибір 2-х елементів з 3-х. Це свідчить про більшу стійкість нервових процесів у майбутніх педагогів – представників мистецтва у порівнянні з іншими майбутніми педагогами.
Висновки
У студентів – майбутніх педагогів творчих спеціальностей (факультет мистецтв) більше стійкість нервової системи та менша рухливість у порівнянні з переважанням парасимпатичного відділу вегетативної нервової системи. Саме тому їм підходить вправа на витривалість, які ніякої допомоги не вимагають частого переключення уваги. До таких вправ належить ходьба, повільний біг, плавання та інші. Вправи повинні виконуватися не менш ніж одну годину. Також їм підходить вправа з активізацією образного сприйняття.
Ключові слова: мистецтво, студенти, психофізіологічні показники, ортостатична проба, нервова система.
Introduction

Future art teachers are a category of students who combine academic work on learning the basics of pedagogy with a large amount of practical work to improve their professional skills [1]. This is especially characteristic of musicians and representatives of fine arts [2–5]. They get a big load on the muscles of fine motor skills. At the same time, the muscles that support the posture also receive a heavy load, especially the muscles of the spine and lower limbs. The cardiovascular system remains completely neglected, since the professional activities of musicians and representatives of fine arts do not involve loads on the cardiovascular system [4–6]. In order to preserve and strengthen health, future teachers of creative specialties need to strengthen the muscles of the trunk and lower limbs to prevent the development of diseases of the musculoskeletal system. They also need to strengthen the cardiovascular system to increase general endurance, which is a necessary condition for maintaining health [7–10]. But at the same time, the question arises: what exercises are most suitable for representatives of the arts? After all, it is necessary that the exercises were selected taking into account the peculiarities of the functional and psychophysiological state of students, and also contributed not only to physical improvement, but also to professional improvement [11–13].

It should be noted that in general there is a unity of art and sport. After all, at all times, people sought perfection - physical, intellectual, mental... And the advanced people of their time combined different aspects of development in themselves, were distinguished by both high intelligence and the ability to do arts and a high level of mastery of their body [6, 8, 14]. The social foundations of this phenomenon were laid in ancient Greece, during the time of the first Olympics [14]. The idea of integrating sports with art originated in ancient Greece. These provisions are analyzed in detail in the works of Stolyarov [14]. The author cites quotes and sayings of ancient philosophers and modern researchers to illustrate this point of view [14]. Thus, Plato considered the main abilities of a person to be musical (for the development of wisdom) and sports (for the development of the body). At the same time, these abilities should be harmoniously developed [14].

A deep supporter of this idea was the founder of the modern Olympic movement, Pierre de Coubertin [14]. He repeatedly pointed out the need to complement and strengthen the connection between sports and art. He emphasized that art should be adjacent to sports, should be connected with the practice of sports, that sports should be considered as a source and as a reason for art and that there should be an alliance between athletes, artists and spectators [14].

Thus, we observe that people who strive for perfection combine the desire to develop both the body and the perception and creation of works of art. But students of non-sports majors of pedagogical universities pay little attention to physical education and sports. That is why, first of all, it is necessary to interest them in physical exercises. For this, exercises should be selected according to the functional characteristics of students. In order to develop recommendations for physical culture and sports for students of pedagogical universities of the faculties of arts, it is necessary to identify their psychophysiological features [15, 16] and features of vegetative regulation of the functional state [17–20]. The activity of the autonomic nervous system does not depend on the will of a person. This means that under normal conditions, a person cannot force his heart to beat less frequently or his stomach muscles to stop contracting. However, it is possible to achieve conscious influence on many parameters controlled by the autonomic nervous system with the help of special training methods [15, 16, 20]. The sympathetic nervous system increases metabolism, increases the excitability of most tissues, and mobilizes the body's forces for active activity. The parasympathetic system helps restore spent energy reserves, regulates the body's work during sleep [15, 16, 18]. The autonomic nervous system adapts the work of internal organs to changes in the environment. The autonomic nervous system is also involved in many behavioral acts carried out under the guidance of the brain, influencing both physical and mental activity of a person [19, 20].

That is why the determination of the peculiarities of vegetative regulation of the physical and psychological state based on the performance indicators of the nervous and cardiovascular systems of students of the Faculty of Arts is necessary for the selection of physical exercises that are most suitable for future teachers of creative specialties.

Purpose: to reveal the peculiarities of vegetative regulation of the functional state based on indicators of the work of the nervous and cardiovascular systems of future teachers of fine arts
and music for the development of recommendations for the use of physical exercises.

Material and methods

Participants

812 students of pedagogical institutions of higher education of Ukraine took part in the study: 88 students of the faculty of elementary education, 76 students of history, 130 of natural sciences, 131 of foreign philology, 93 of the faculty of preschool education, 198 of Ukrainian language, 25 of the faculty of physical education and sports, 24 students from the Faculty of Arts, 47 students from the Faculty of Psychology and Sociology.

Determination of properties of the nervous system by psychophysiological tests

The determination of the features of the nervous system was carried out according to the Psychodiagnostics program. The program [1, 16] provides determination of the speed of a simple visual-motor reaction, determination of the reaction speed of choosing two elements from three. The program works as follows. Various images appear on the screen. When determining the speed of a simple visual-motor reaction, the subject presses the left mouse button as soon as he sees any image on the screen. When determining the reaction speed of choosing two elements out of three, the subject reacts to images of geometric figures by pressing the left mouse button and to images of animals by pressing the right mouse button. The subject does not react to all other images.

During psychophysiological testing, the following indicators were determined for each test: reaction time, number of errors. The shorter the reaction time, the higher the mobility of nervous processes, which is also related to the activity of the sympathetic division of the autonomic nervous system. The smaller the number of errors in the reaction test of choosing two elements out of three, the higher the strength and stability of nervous processes, which is also associated with the activity of the parasympathetic department of the autonomic nervous system [13, 14, 15].

Determination of the functional state by the orthostatic test

Orthostatic reactions were determined by the results of heart rate in the lying position and in the standing position. Heart rate values in the supine position greater than 80 beats·min⁻¹ were considered indicators of inefficient work of the cardiovascular system. The difference between the heart rate in lying and standing positions of more than 30 beats·min⁻¹ was considered as an indicator of difficult adaptation of the body to a change in body position [1, 21].

Statistical analysis

During the statistical processing of the research results, the normality of the distribution of each sample was first checked using the Kolmogorov-Smirnov test. Since the samples obeyed a normal distribution, parametric processing methods (Student's method for comparing mean values) and hierarchical cluster analysis were used.

Results

Based on the comparison of indicators of psychophysiological functions and orthostatic reactions of students of different clusters according to Student's method, the formed clusters were characterized: 1 cluster - students with a predominance of the sympathetic department of the autonomic nervous system and the mobility of nervous processes; 2 - students with predominance of the sympathetic division of the autonomic nervous system and stability of nervous processes [1].

It should be noted that the second cluster (predominance of the parasympathetic department of the autonomic nervous system and stability of the nervous system) included the largest number of students of the Faculty of Arts (Fig. 1). In second place are students of the Faculty of Physical Education and Sports.
Fig. 1. The number of students (as a percentage of the total number of students at the faculty), with a predominance of the sympathetic (parasympathetic) departments of the nervous system and the mobility (strength) of nervous processes:

Cluster 1 - Predominance of the sympathetic division of the autonomic nervous system
Cluster 2 - Predominance of the parasympathetic division of the autonomic nervous system

* - the relationship of the faculty with the predominance of the sympathetic (parasympathetic) departments of the nervous system and the mobility (strength) of nervous processes is reliable at p<0.05

Faculties: 1 - Primary education, 2 – Historical, 3 – Natural, 4 - Foreign philology, 5 - Preschool education, 6 - Ukrainian-speaking, 7 - Physical education, 8 – Arts, 9 – Psychological, 10 – Total number

We can explain the obtained fact by the fact that students - representatives of fine arts and music are more prone to long-term work that requires a lot of concentration. This can be related to both genetic predispositions and formation during art studies.

Students of the Faculty of Arts have significantly longer latency of visual-motor reaction compared to representatives of other faculties (Fig. 2). This indicates a lower mobility of nervous processes of students of the Faculty of Arts in comparison with students of other faculties.

Fig. 2. The value of the time of a simple visual-motor reaction in students of the Faculty of Arts in comparison with students of other faculties (Elementary Education, History, Natural Sciences, Foreign Philology, Preschool Education, Ukrainian Language, Physical Education, Psychology)

*** - differences are significant at p<0.001
At the same time, future art teachers have significantly fewer errors in the test for choosing 2 elements out of 3 (Fig. 3). This indicates greater stability of nervous processes in future teachers - representatives of art compared to other future teachers.

Fig. 3. The number of errors in the reaction time test for choosing 2 elements out of 3 among students of the Faculty of Arts in comparison with students of other faculties (Elementary Education, History, Natural Sciences, Foreign Philology, Preschool Education, Ukrainian Language, Psychology).

*Data from the Faculty of Physical Education and Sports were not included in the processing of the results, as the students of this faculty showed the least number of errors in this test*** - differences are significant at p<0.001

We also obtained reliable differences in the value of the indicator "Time of simple visual-motor reaction, ms" for the representatives of the two clusters (Fig. 4). It was found that this indicator is significantly higher in representatives of the second cluster "Predominance of the parasympathetic department of the autonomic nervous system." This indicates that students with a predominance of the parasympathetic department of the autonomic nervous system have lower mobility of nervous processes compared to representatives of the first cluster.

Fig. 4. The value of the time of a simple visual-motor reaction in students with a predominance of the sympathetic (parasympathetic) departments of the nervous system and the mobility (strength) of nervous processes of various faculties of a pedagogical university:

*** - differences are significant at p<0.001
But the number of errors, on the contrary, is significantly lower among representatives of the second cluster "Predominance of the parasympathetic department of the autonomic nervous system" (Fig. 5). This indicates greater stability of the nervous system in students of this cluster.

Significantly lower heart rate values in the lying position were also found for students - representatives of the second cluster (Fig. 6). This may indicate a higher level of general endurance of students of the second cluster, as well as the presence of features of autonomic regulation of cardiac activity, which promotes activation of the parasympathetic division of the autonomic nervous system at rest.
Discussion

It should be noted that in our previous studies [1], we found the predominance of the parasympathetic division of the autonomic nervous system at rest in students of the Faculty of Physical Education and Sports. We can explain this by a higher level of training, which leads to the economization of the body’s work at rest. In the study presented in the present work, we obtained results that indicate the predominance of the parasympathetic division of the autonomic nervous system also among students of the Faculty of Arts. We can explain this fact by the presence of hereditary features that determine the properties of the nervous system of students who choose the path of artistic activity. Based on the obtained data, it can be noted that from the point of view of hereditary features of the nervous system of students of the Faculty of Arts, these students have more stability of the nervous system and less mobility in combination with the predominance of the parasympathetic department of the autonomic nervous system. That is why endurance exercises that do not require frequent switching of attention are suitable for them. Such exercises include walking, slow running, swimming. Exercises should be performed for at least one hour. They will also be suitable for exercises with the activation of visual perception. For example, our previous works presented sets of exercises that combine Western and Eastern approaches to physical culture [6, 8].

Based on the above, students were given the following recommendations. Every day for 2 hours, walk outside in the city or in the park [22, 23] (where you like it most) for 1 hour and take pictures of everything you like. Measure the pulse 3 times during the journey, record the results. At home, choose 3-5 of the most successful pictures. Record the results of heart rate measurement and take photos.

We also recommend future teachers of creative specialties to do special gymnastics in verses 2-3 times a week for the development of creative abilities and physical fitness [6, 8, 24]. When performing each exercise, imagine as much as possible what is being said in the line of the poem that corresponds to the exercise. Make drawings or create (choose) music for the complex as a whole or for each exercise separately. This recommendation stems from the concept of the unity of sport and art.

The study confirmed the opinion of Stolyarov [14], who attaches particular importance to the analysis of the issue of the integration of sports and art. His works justify the necessity and show the real possibility of integrating sports and art as two elements of modern culture, summarize and systematize the practical experience accumulated in this field. Stolarov presented a specific program of integration of sports and art [14].

Currently, in addition to the need to integrate sports and art, one more aspect of the human personality can be highlighted - intelligence, one of the manifestations of which is science. In ancient times, science and art were equated. As shown above, Plato considered music to be a manifestation of wisdom [14]. However, at present, science can be separated into a separate aspect due to its enormous influence on society and individual human development.

Thus, the goal of the work was achieved. Data on the unity of sport and art have been confirmed. Peculiarities of vegetative regulation of functions, properties of the nervous system and orthostatic reactions of future teachers of creative specialties were revealed.

Conclusions

1. Two groups of students - future teachers were identified: with a predominance of the sympathetic department of the autonomic nervous system and with a predominance of the parasympathetic department of the autonomic nervous system. The largest number of students with predominance of the parasympathetic department of the autonomic nervous system was found among students - future teachers of creative specialties (faculty of arts).

2. Students of the Faculty of Arts have significantly longer latency time of visual-motor reaction compared to representatives of other faculties. This indicates a lower mobility of nervous processes of students of the Faculty of Arts in comparison with students of other faculties. Along with this, future art teachers have significantly fewer errors in the test for choosing 2 elements out of 3. This indicates greater stability of nervous processes in future teachers - representatives of art compared to other future teachers.

3. Significantly lower heart rate values ??in the supine position were also found for students with a predominance of the parasympathetic department of the autonomic nervous system, among whom the largest number are students of the Faculty of Arts. This may indicate a higher level of general endurance of these students, as well as the presence of features of the autonomic regulation of cardiac activity, which contributes to the activation of the parasympathetic department of the autonomic nervous system at rest.

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Students - future teachers of creative specialties (faculty of arts) have more stability of the nervous system and less mobility in combination with the predominance of the parasympathetic department of the autonomic nervous system. That is why endurance exercises that do not require frequent switching of attention are suitable for them. Such exercises include walking, slow running, swimming. Exercises should be performed for at least one hour. They will also be suitable for exercises with the activation of visual perception

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