

DYNAMIC OF GIRL STUDENTS' PSYCHO-PHYSIOLOGICAL INDICATORS IN PROCESS OF THEIR STUDY AT PEDAGOGICAL HIGHER EDUCATIONAL ESTABLISHMENT

Kolumbet A.N.

Kiev National University of Technology and Design

Abstract. *Purpose:* to study dynamic of psycho-physiological indicators of pedagogic higher educational establishments' girl students. *Material:* in the research 510 girl students participated. We assessed: responsive abilities, static and dynamic balance, orientation in space, quickness of operational thinking, volume of rote memorization, distribution of attention, accuracy level, quickness and re-switching of attention, accuracy of fulfillment of task. *Results:* we have found weakening of accuracy of movement's amplitude and pre-set value of force reproduction; reduction of indicators of response to vertically falling object, static and dynamic balance. We also registered improvement of indicators of nervous processes' dynamic and ability to constructive praxis. *Conclusions:* uneven reduction of most of psycho-physiological indicators negatively reflects in girl students' motor fitness level and professional abilities.

Key words: psycho-physiological, girl students, professional, abilities, pedagogic.

Introduction

Working time of teachers is 3-5 working hours directly on working place and 2-4 hours of independent work at home. Such working mode causes deficit of motor functioning, which is called hypokinesia [15]. It is manifested in work with limited movements, low energy consumption by muscles, local muscular functioning, keeping forced working position for long period of time, monotonous movements, high nervous emotional background [15, 18, and 21].

Keeping forced working position for long period of time is very unfavorable factor of teachers' professional functioning. As a rule, teachers (mainly of older generation) shall keep very monotonous position (sitting or standing) in process of their professional functioning. It makes background and chest the less mobile parts of body and results in loss of backbone's flexibility and correct correlation of muscles [18, 30]. Besides, teachers have to make many local movements by muscles of forearm and hand during working day. Some researchers confirm that great load on weal muscles can cause over-fatigue of these muscular groups. In its turn it results in increased attention to nervous-muscular apparatus of both arms [17, 26, 33, and 34]. These teachers often suffer from bad eyesight, fatigue of arms and backbone muscles [22, 24].

At present, girl students of pedagogic specialties have spend much time working with computer. It is characterized by immobile static posture, minimal monotonous movements of upper limbs, constant tension of eyesight. All these factors negatively influence on their self feeling [35]. Part of pedagogic work implies being in vertical position with static load on legs' muscles. High academic load against the background of low motor functioning and long keeping of static posture is one of factors, inhibiting physical development and psycho-physiological status of organism [2, 28]. Restriction of motor functioning negatively influences on human health [36, 39].

In many works [2, 6, 10, 11, 27, and 31] attention is paid to possible deviations in health, weakening of general physical and mental workability, initial disorders in some functional systems of organism. In particular, K.A. Sidorova [23] et al. researched temper, quickness of response of urban and countryside girl students. In researches by O.G.Litovchenko [19] the data of simple and complex visual motor responses and operational memory were analyzed. A.V. Kostyunin [16] studied functional mobility of nervous processes, reaction to moving object. Thus, researchers rather widely analyze different psycho-physiological indicators of students in dynamic. Only in works by L.N. Barybina [3] there is a conclusion about interconnection of psycho-physiological indicators with individualization of physical education at higher educational establishment. With it, researchers have not analyzed influence of psycho-physiological indicators' dynamic on professional qualities of future profession. As a result there is a question about purposefulness of specialized physical education for improvement of these indicators.

Purpose, tasks of the work, material and methods

The purpose of the work is to study dynamic of psycho-physiological indicators of pedagogic higher educational establishments' 1st – 3rd year girl students.

The methods and organization of the research: 540 girl students from 18 to 22 years' age were tested. In the research analyzer of motor-coordination reactions ADKR-2 was used.

The level of girl students' *accuracy* was assessed with the following tests: 1) accuracy of reproduction of pre-set value of force was determined with the help of hand dynamometer; 2) accuracy of reproduction of pre-set amplitude of arms' movements was measured with kinematic meter of M.I. Zhukovskiy.

Responsive qualities were assessed with the following tests: 1) test for quickness ("Catching of rule") [8]; 2) determination of reaction to moving object. For this test computer program "Prognoz" was used (Institute of physiology, named after A.A. Bogmolets, AS of Ukraine, Kiyev; 3) test for quickness of visual-motor response (simple and complex) (with computer program "Prognoz"); 4) test for quickness of reaction ("Catching of stick") [1]; 5) complex coordination test: determination of accurate, differently directed speed-power movements for definite time (computer program "Prognoz"). Для оценивания способности *ориентации в пространстве* использовался тест «Лабиринт» [7].

For assessment of *professionally significant abilities* of girl students we used the following tests: 1) distribution of attention ("finding of numbers" [5]); 2) volume of rote memorization ("Quantity of men figures" [5]); 3) distribution of attention and quickness of operational thinking ("Assembly of puzzles during certain period of time" [1]); 4) quickness of operational thinking ("Koss's cubes" [5]); 5) on special device we determined: quickness, re-switching and concentration of attention; accuracy of fulfillment of pre-set task [9].

Static balance was tested with Romberg's test (posture of "Stork"); 2) *dynamic balance* was assessed with test "Turns on gymnastic bench" [29].

Results of the research

When testing *accuracy of reproduction of pre-set space amplitude of arms' movements* we analyzed dynamic of this indicator's changes without girl students' visual control. It was found that indicators of reproduction of arm movement amplitude's accuracy were the best in 1st and 3rd year girl students and the worst in 3rd year girl students (see table 1). When approaching to 3rd year of study value of error increases. Reduction of the tested indicator was 14.6%. It witnesses about worsening of this indicator in the process of studying.

When testing indicator of *accuracy of pre-set force value reproduction* (error) we found increase from 1st to 3rd year of studying. It witnesses about increase of error and worsening of indicator with approaching to 3rd year by 13.5%. The worst result of this indicator was registered in 3rd year girl students. Deviations from pre-set value of effort were nearly 3 kg. The best indicator was in 1st year girl students. Them steady negative dynamic appears in ability to accurately reproduce the pre-set value of force.

Analysis of results of test for *quickness of reaction* showed that this indicator was the highest in 1st year girl students and the worst – in 3rd year girl students. Dynamic of its changes is also steadily negative from 1st to 3rd year of study. The level of 3rd year girl students was "below average" in comparison with mean age standards. It says about worsening of girl students' sensor motor response by the end of study period.

The same dynamic was intrinsic to indicators of second test: *quickness of response to vertically falling object* ("Catching of rule"). This test permitted to register the best results in 2nd year girl students and the worst – in 3rd year girl students. Dynamic of this indicator's changes is also steadily negative from 2nd to 3rd year of study (18%). It also shows worsening of motor response by the end of study.

Table 1. Mean values of girl students' psycho-physical indicator for the period of study at higher pedagogical educational establishment

Indicator	Unit of measurement	Years of study		
		1st	2nd	3rd
Accuracy of movements amplitude's reproduction	Error, degrees	3.34	3,50	4.70
Accuracy of pre-set force value's reproduction	kg	2.00	2.40	2.70
Quickness of response ("Catching of stick" test)	time, m.sec.	235	260	267
Quickness of reaction ("Catching of rule" test)	cm	14.60	14.20	17.20
Accuracy of response to moving object	Quantity of times	2.00	2.60	2.70
Forward reaction to moving object	Quantity of times	9.70	7.00	8.10
Delayed reaction to moving object	Quantity of times	8.30	10.40	9.60
Quickness of simple visual-motor reaction	time, m.sec.	220	250	286
Quickness of complex visual-motor reaction	time, m.sec.	479	429	410
Total time of complex visual-motor response	time, m.sec.	465	447	444
Static balance	time, sec.	19.40	15.60	12.10
Dynamic balance	time, sec.	12.89	9.99	8.97
Orientation in small space	time, sec.	10.00	11.75	11.85
Accuracy of orientation in space	mm	1.40	1.70	1.50
Orientation, responding and differentiation qualities	points	5.80	6.40	4.00
Quickness of operational thinking	points	43,70	47.70	51.10
Distribution of attention	Conv. Un.	37.80	40.40	35.00
Volume of rote memorizing	quantity	6.20	5.10	2.90
Distribution of attention and quickness of operational thinking	minutes	11.18	13.83	17.12
Quickness of re-switching and concentration of attention	Quantity of mistakes	0.71	0.80	0.82

Analysis of changes of *response accuracy to moving object* indicators showed that the best results were at 3rd year of study, the worst – at 1st year. It should be noted that definitions “the best” and “the worst” are rather conventional.

As a result of the research we found that the highest value of *forward responses*' indicator was just in 1st year girl students: from 20 offered reactions, girl students demonstrated in average 9 forward reactions. The lowest indicators were found in 2nd year girl students. 3rd year girl students showed in average 8 forward reactions from 20 offered. Reduction of indicator from 1st to 3rd year was 14.4%.

Quantity of *delayed reactions* is rather high in comparison with their total quantity for all years. It is negative indicator for characteristic of one of the most important coordination qualities of future pedagogues – to see an object in space and in movement. The main indicator of response to moving object is timeliness and quickness of response, connected with concentration of attention.

Change of indicator of *simple visual-motor response (SVMR)* also has negative dynamic. The best indicators of simple visual-motor response were found in 1st year girl students and the worst – in 3rd year girl

students. Dynamic of the tested indicator witnesses, that from 1st year to 3rd year it reduced by 23%. It witnesses about increasing of simple visual motor response time by the end of study period and, consequently, about worsening of indicators of girl students' sensor motor responding by the end of study period.

Results of assessment of complex visual motor response (CVMR) witness about improvement of this quality from 1st to 3rd year. Analysis of this test results showed that the best results were in 3rd year girl students and the worst – in 1st year girl students. Analysis of this indicator changes showed positive dynamic from 1st to 3rd year. Total improvement of this indicator was 13.4%.

Time changes of girl students' CVMR reflected in *total time of CVMR*: the best indicator of total time was registered in 3rd year girl students and the worst – in 1st year girl students. Dynamic of this indicator's change from 1st to 3rd year shows that total time of girl students' CVMR shortens (up to 4.5% by the end of study period).

It was also found that from 1st to 3rd year there takes place negative dynamic of Romberg's test indicator ("Stork" posture). It shows worsening of girl students' *ability to keep balance*. Reduction of this indicator from 1st to 3rd year is rather substantial – 37.6%. It is rather negative factor. It should be noted that in general the level of this test's results meets average age standard and is, even, at its top.

The researches also determined that from 1st to 3rd year there is observed steady negative dynamic of girl students' *dynamic balance* indicators. Reduction of these indicators was 33.5%. It is also a negative factor. However, it should be noted that in general the level of this test's results meets average age standard.

Determination of *accurate orientation in small space* (orientation ability), considering time and accuracy showed that the best results of passing labyrinth were demonstrated by 1st year girl students and the worst – by 3rd year girl students. Dynamic of this indicator's changes shows that time of passing of labyrinth increases. In general by the 3rd year time indicator worsens by 16%.

Analysis of dynamic of *orientation in space accuracy* witnesses, that during study period there are no significant changes in ability to accurately fulfill motor actions. We found that the best indicators of this test were in 1st year girl students and the worst – in 2nd year girl students. Dynamic of this indicator demonstrates insignificant increase from 1st to 3rd year by 7%.

Changes of indicators in test *orientation qualities* showed that the lowest values of these indicators were in 2nd year girl students. In 3rd year girl students we registered stabilization of these indicators. But, in general, in the process of study these indicators have negative dynamic. Complex assessment of orientation in space shows that this ability weakens by 26% by 3rd year of study, comparing with 1st year.

Dynamic of complex coordination test results (assessment of *orientation, responding and differentiation qualities*) showed that the best results were received in 2nd year girl students and the worst – 3rd year girl students. In general reduction of this indicator from 2nd to 3rd year was 13.4%. Worsening of complex coordination test indicators occurred at the account of increasing of time, required for fulfillment of task. Results of complex coordination test characterize general negative changes in the tested psycho-physiological parameters of kinesthetic, responding and orientation qualities of girl students in the process of their study. It should be noted that girl students of all years of study have low level of complex coordination test indicators.

Discussion

Mental functioning of man is accompanied by changes of functional status of organism's different organs and systems. Value of conditional responses decreases, reaction to different by impact irritators weakens, stability of attention reduces. Sensitivity of visual analyzer increases after insignificant intensive work. Under the greatest load are systems of direct memorizing and concentration of attention. Mental work takes place with weak motor functioning. It results in appearing of conditions of increased fatigue, weakening of workability and worsening of self-feeling.

The conducted by us research expands the data on girl students' psycho-physiological indicators. In contrast to previous researches, conducted by a number of authors [3, 16, 19, and 23] we analyzed rather a wide spectrum of psycho-physiological indicators in dynamic from 1st to 4th years of study in context of their interconnection with future profession.

Analysis of results of girl students' psycho-physiological indicators showed their ambiguous character from 1st to 3rd years of study. We determined reduction of indicators of movements' amplitude reproduction accuracy,

pre-set force value, reaction to vertically falling object, indicators of static and dynamic balance. It complies with data of other researchers [2, 4, 11, 16, 22, and 37].

It should be noted that there is improvement of nervous processes and ability to constructive praxis. The same changes were noted in the works by D.V. Bondarieva [4], V.A. Kyriushin [10], V.I. Martynova [20], L.T. Urumova [25], Zh.L. Kozina [32].

Our research confirms the conclusions of specialists [3, 10, 19, 25, and 38], that uneven reduction of most of psycho-physiological indicators reflects negatively not only in girl students' motor fitness. We proved [12-14], that reduction of these indicators negatively reflects in professional abilities of future teachers.

Influence of physical education in higher educational establishment on development of motor skills and perfection of professionally important psycho-physiological qualities has become extremely important as on to day.

Conclusions

1. In the research we found reduction of most of indicators of kinesthetic, orientation and responding qualities of girl students in process of study.

2. Purposeful improvement of kinesthetic, orientation and responding qualities with the help of specialized methodic at physical education lessons permits to stop negative dynamic of psycho-physiological indicators and improve them. Finally it will positively reflect in professional skillfulness of pedagogue.

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Conflict of interests

The author declares that there is no conflict of interests.

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Information about the author:

Kolumbet A.N.; <http://orcid.org/0000-0001-8775-4232>;
re_play@3g.ua; Kiev National University of Technology and
Design; st. Nemirovich-Danchenko, 2, Kiev, 14013, Ukraine.

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