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The Influence of an Individual Annual Cycle on a Person's Psycho-Physiological Conditions.

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ABSTRACT

This article discusses the problem of influence of individual and seasonal rhythms on a condition of various human bodies and their functions. The features of psycho-physiological conditions of the students of Teacher training college of the Belgorod State University in different trimesters of an individual annual cycle are studied with the help of the following techniques: "The Individual health level estimation on the basic parameters of an organism"; "Determination of biological age by V.P. Voytenko"; "The Definition of health factor (FH) on degree of adaptation of system of blood circulation"; "R.M. Bayevsky's Adaptive Potential"; "The Estimation of intellectual work capacity based on Anfimova's proof test"; "Raven's Progressive Matrices"; "The Level of Personal Uneasiness (C.Spielberg - J.Hanin)". Rufe, Kerdo, Martineta index, endurance factor were calculated. It was found out that state-of-health estimation, functional properties of an organism, features of mental processes and students essential conditions of the first trimester of an individual cycle were high. Some characteristics of the psycho-physiological status have wavy dynamics within the limits of individual annual cycle, however decrease in the majority of indicators takes place in the fourth trimester.

Keywords: An individual annual cycle, psychology, physiology, a person, hronobiology, health, adaptation, psychophysiology.

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INTRODUCTION

There are some number of the research papers in medical and biologic sciences devoted to a problem of influence of individual and seasonal rhythms on a condition of various organs and their functions. Some of them indicate that stability and health of a person, its fitness to environmental factors can be provided by the endogenic nature of an individual year biorhythm [1]. The authors of this research refer to the assumption of availability of an individual annual cycle between 2 birthdays made by D. Bitout and I. Assenmaher in 1969. The individual (endogenic) annual cycle (IAC) does not depend on a calendar year and includes the periods (trimesters) from one birthday to other [2-8].

The long-term complex estimation of properties and conditions of psychophysiological and psychological character at various groups of examinees has allowed us to reveal the individually-year periodicity of internal and external signs of adaptation, and also to define the most obvious mechanisms of their formation. For the first time, the dependence of life duration on individual and seasonal rhythms [9] has been established on the basis of the analysis of the parish register containing the data about the inhabitants, living in the territory of the Belgorod region during the period with 1897 for 2007. We analyzed a 15-year-old cycle of creativity of M.Tsvetaeva taking into consideration the belief that the poetic activity of the author supposes individual annual rhythm. Besides, the assumption of specific features of annual biological rhythms of a person has been approved on sample of patient records of regional clinical hospital of Belgorod with the diagnosis: sharp disturbance of brain blood circulation (SDBBC), therefore dependence of an aggravation of disease on an individual annual rhythm of patients has been revealed. Complex research has been conducted, also on sample of high school students when the features of psychophysiological and psychological adaptation to educational activity during individual and seasonal annual cycles [10] were revealed.

At the same time the data about features of adaptive processes, a physiological condition of the basic systems and an organism as a whole, mental functions in different trimesters of IAC is insufficient. Knowledge of laws of development of IAC, features of functioning of an organism at its different stages is important not only from the point of view of medicine, but also planning of educational process, providing psychological consultations, work in extreme conditions, carrying out sport-improving activity.

The Research objective was to find out psychophysiological conditions of students during different periods of IAC.

Research problems:

- To study a state of health of students at different stages of IAC;
- To study features of a physiological and functional condition of an organism of students at different stages of IAC;
- To study the parameters of mental processes of students at different stages of IAC.

METHODS

The experimental part of work is executed on the basis of Belgorod State University in 2013-2014 with 80 fourth-year students who participated in the research. Groups were formed with account of a stage (trimester) of an individual annual cycle (IAC), gr. #1 - the first trimester of IYC (three months from a date of birth); gr. #2 - the second trimester; gr. #3 - the third and gr. #4 - the fourth.

For studying of features of psychophysiological conditions of students at different stages of IAC we used the following techniques: "The Individual health level estimation on the basic parameters of an organism"; "Determination of biological age by V.P. Voytenko"; "The Definition of health factor (FH) on degree of adaptation of system of blood circulation"; "R.M. Bayevsky's Adaptive Potential"; a functional condition of cardiovascular system evaluated by means of tests with account of Rufe, Kerdo, Martineta index and endurance factor; "The Estimation of intellectual work capacity based on Anfimova's proof test"; "Raven's Progressive Matrices"; "The Level of Personal Uneasiness (C.Spielberg - J.Hanin)"; a type of accentuation of character by G.Shmishek's technique [11].

MAIN PART

The health level of students was studied by means of a number of techniques including “The Individual health level estimation on the basic parameters of an organism”. According to a number of authors self-descriptiveness of the given method makes 50-80 % [11]. Results are presented in Table 1.

Table 1: The Individual health level estimation on the basic parameters of an organism depending on trimester of IAC (integrating factor).

HUMAN BODY SYSTEMS	Groups			
	1	2	3	4
The central nervous system	15,7±2,5	24,8±0,9*	24,0±1,9*	25,1±1,8*
System of respiratory organs	13,2±1,6	21,4±2,4*	16,9±2,0*	15,8±1,8
System of organs of blood circulation	18,7±2,9	29,4±2,4*	24,3±3,4	21,5±3,6
System of organs of hemopoiesis	12,8±1,9	19,4±2,9*	24,1±2,0*	17,4±2,5*
Digestion	11,1±2,0	16,5±1,6*	15,8±1,8*	18,5±2,4*
Secretory and skin	7,0±0,6	10,5±1,7	7,4±1,1	17,4±1,8**
Endocrine	4,4±0,9	12,0±1,9*	10,2±0,5**	11,3±2,0**
Musculoskeletal system	17,0±3,8	19,0±0,8	14,0±1,0	16,7±1,3
The lymphatic	8,4±0,9	14,6±2,4*	9,4±0,9	13,0±1,3*
The immune	11,8±1,6	15,6±1,5*	9,9±1,4	16,6±2,0*
Peripheral nervous system	13,6±2,5	17,0±0,9	11,7±1,2	16,9±1,9
Otolaryngology	9,7±0,8	16,4±2,1*	11,8±2,0	19,3±2,6**
Vegeto-vascular dystonia(peripheral blood supply impairments)	14,8±2,3	23,1±2,4*	14,9±1,4	23,6±2,4*

The note: authentic changes in comparison with control group (gr. #1)

* - at P <0,05; ** - P <0,01; *** - P <0,001.

Results have shown that the average integrating indicator of health in the first group has made 12, 2 that corresponds to a high level of health. The students who are in second trimester of IAC have an average factor of health equal to 18, 37 that characterizes a state of health as above average. The authentic increase of the integrating factor on some systems of an organism that indicated lower health level of these systems in comparison with students of first trimester of IAC is thus noticed, the results corresponding to a health average level on two systems are received. Analyzing the health of students of the third trimester of IAC it has been revealed that the average integrating factor of morbidity made 14, 95, i.e. the state of health - above average. The estimation of the students’ health of fourth trimester of IAC made – 17, 9 that corresponds to level of health above average. However the factor characterizing health of nine systems of an organism authentically exceeded the indicator of the first group that indicates the decrease in functional activity of these systems.

The indicators regarded as additional criteria of an estimation of the health of students include biological age, an index of a self-estimation of health, a health factor. The results under study are presented in Table 2.

Table 2: The indicators characterizing a state of health of students at different stages of IAC

Indicator	Groups			
	1	2	3	4
Biological age, years	34,9±0,8	80,9±17,5*	35,4±0,7	37,3±2,1
Index of a self-estimation of health	12,5±0,4	14,1±0,3*	15,3±0,6*	15,5±0,9*
Health factor	2,2±0,1	3,0±0,5	2,0±0,1	3,7±0,5*

The calendar age of students participating in research was approximately identical and made 21±0, 8 years. Results of studying of biological age with the help of the settlement method considerably differed from real age of respondents that indicates increase in degree of ageing in comparison with average standards. However it is necessary to notice that the actual biological age of the students of first trimester of IYC is approaching to the calendar age.

The index of a self-estimation of health has appeared authentically above the students of the second, third and fourth groups in comparison with group #1 that also indicates lower individual estimation of a state of health students of these groups.

For more complete analysis of the health level of the surveyed we studied the health factor (HF) on degree of adaptation of system of blood circulation. From tab. 2 it is clear that HF of the first trimester students averaged 2, 2 that corresponds to satisfactory adaptation of blood circulation system. The increase of the given indicator that is authentically noted within the group of students of the fourth trimester is an unfavorable factor which testifies to partial adaptation of an organism and to its possible failures.

Studying of anthropometrical parameters of students has shown that somatometric, somatoscopic and physiometric parameters surveyed on the average correspond to age standards. The Table shows the authentic increase in weight of a body and frequency of pulse of the third group students in comparison with group #1.

Table 3: Features of a functional condition of an organism of students at different stages IAC

Indicator	Groups			
	1	2	3	4
Kerdo index	15,9±6,2	-1,25±9,3	21,1±3,2	16,5±5,7
Adaptable potential	1,18±0,05	1,25±0,04	1,26±0,08	1,37±0,04*
Rufe Test (indicator of heart activity)	11,5±1,1	9,6±1,8	14,7±2,6	14,0±0,9
MartinetaTest	9,2±1,1	10,0±1,1	9,8±0,9	6,9±0,7
Ortostatic test	4,0±0,3	2,8±0,1*	2,7±0,2*	2,8±0,4*
Endurance factor	15,9±1,2	16,1±1,8	15,7±0,9	18,5±0,5*

Studying of adaptive potential has shown that the least index refers to the students being at the first stage of IAC, this indicator is characterized as satisfactory adaptation. The index increase indicates decrease in adaptive potential that is accompanied by some displacement of indicators of a miocardial no-haemodynamic homeostasis within the normal significances, besides strain of regulation systems increase and the "payment for adaptation" increases. In our research the authentic increase of an index of adaptive potential concern students of the fourth group.

The physiological condition and degree of training of cardiovascular system evaluated by means of functional tests: Kerdo index, ortostatic test, Martineta test, Rufe test, endurance factor. These techniques which allow revealing the degree of functional activity, level of adaptation and degree of training of cardiovascular system, are most often applied during mass inspections. It has been revealed that the representatives of the third and fourth groups have the increased indicator of heart activity, its average significance for these groups makes 14, 3 that testifies to satisfactory adaptive potential of cardiovascular system. At the same time the students who are in the first and second trimester have the indicators of heart activity equal to 11,5 and 9,6 accordingly that characterizes a functional condition of cardiovascular system as good.

The ability of a cardiovascular system to restore after physical activity has been studied by means of Martineta test. The results have shown that students of fourth and first trimester of IAC had satisfactory adaptive ability of cardiovascular system whereas regenerative possibilities of students of the second and third trimester are evaluated as boundary with the unsatisfactory.

The factor of endurance used for the estimation of degree of physical activity of cardiovascular system has standard figures: 12 - 15 conditional units. Analyzing the obtained data it is necessary to highlight that the indicator of the students of the first, second and third groups is considered to be within the normal range; as for the students of the fourth trimester the factor has been considerably increased that testifies to non-training of cardiovascular system.

Estimation of the vegetative status of an organism of students, i.e. degree of influence on cardiovascular system of vegetative nervous system we evaluated by means of Kerdo index. The analysis of the results has shown that sympathetic (exciting) influences in activity of vegetative nervous system of the

students of the first, third and fourth trimesters prevail. And indices of students of these groups fell outside normal limits that indicate high degree of sympathetic influences. The indicator of the second trimester students approaches to 0, i.e. functional balance in activity of sympathetic and parasympathetic departments is marked.

During our experimental work we evaluated some features of mental processes within the group of students at different stages of IAC (Table 4).

Table 4: Features of mental processes at students at different stages IAC

Indicator	Groups			
	1	2	3	4
Factor of efficiency of cerebation	118,5±10,4	82,3±3,4*	62,3±13,1*	82,1±3,9*
Factor of mobility of nervous processes	1,5±0,1	1,6±0,1	1,6±0,1	1,5±0,1
Intelligence index	71,0±1,1	65,6±3,9	65,2±4,7	75,0±2,6
Level of personal uneasiness	41,8±1,9	44,4±2,2	48,4±0,8*	48,9±0,8*

The results of studying of parameters of intellectual working capacity have shown that efficiency of cerebation - authentically above the standards (the students of first trimester of IAC), in all other trimesters the indicator is considerably lowered, with a minimum mark in the third trimester. The level of personal uneasiness was authentically above the normal data in the third and fourth trimesters of year and was characterized as high while in the first and second trimester have been evaluated as moderate.

CONCLUSION

The practical importance of research consists in granting of possibility of use of a method of biological rhythms (trimesters of an individual annual cycle and seasons of calendar year) for forecasting, preventive maintenance and therapy of the psychological, psychosomatic problems, concerning psychophysiological adaptation of the person.

RESULTS

- High level of health assessment was shown by students of the first trimester of IAC. In all other groups the result was much lower, and respectively their level of health can be estimated as average.
- The physiological condition of an organism and functioning of cardiovascular system of students of the first trimester was estimated as good, students of the third and fourth trimesters showed decrease in performing functional activities.
- The students of the first trimester of IAC demonstrated high intellectual working capacity, in other groups the indicator has been lowered.
- Level of personal uneasiness was authentically above the standard (the third and fourth trimesters of year) and was characterized as high while the figures in the first and second trimester have been estimated as moderate.

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