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PRACA ORYGINALNA
ORIGINAL ARTICLE

CHRONIC FATIGUE DEVELOPMENT OF MODERN HUMAN IN THE CONTEXT OF V. VERNADSKY'S NOSOPHERE THEORY

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ABSTRACT

Introduction: The existence of the noosphere as a sphere of mind influences human life processes, particularly their physical and mental health, directly. That is why a need arises to consider the biosphere development in the context of the "boom" of scientific thought and noosphere with its processes affecting human health.

The aim: The research purpose is to reveal the influence of noospheric processes on human health, in particular the information flow effects on human morphofunctional state expressed as chronic fatigue.

Materials and methods: A complex of study methods was used in the research: general scientific (analysis, synthesis, comparison, correlation, systematization, generalization) and empirical (observation, conversation, questionnaire). The research was conducted within the framework of "Axia" international project (Innovation in Education). For the stated research purpose achievement subjective state diagnostic technique of "WAM" as used, intended for the qualitative subjective evaluation of three main functional psycho-emotional human states: well-being, activity and mood.

Respondents of three age groups were involved in the research, 347 people in each group. The first group included the responders aged 14 to 19; the second group included the responders aged 19 to 35; the third group consisted of the respondents aged 35 to 60.

Results: The research results confirmed that the noospheric processes are followed by the acceleration of human life pace, information pressure causing the development of human mental fatigue, energy depletion, tiredness and chronic fatigue. The results of empirical studies of the influence of the noospheric processes anthropoprice on the human well-being, activity and mood showed the dependence of the positive integral estimation of human subjective state on the orientation towards life-long learning, personal values regardless of the age.

Conclusion: The proposed article reveals the influence of noospheric processes on human morphofunctional state, scientifically grounds the connection and dependence of human tiredness on the noospheric processes anthropoprice.

KEY WORDS: biosphere, noosphere, noospheric processes anthropoprice, chronic fatigue

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INTRODUCTION

Modern science, including medicine, considers this or that phenomenon in terms of a particular system. In the vast majority of cases the system includes the components spread within the local territory and on a particular part of the globe. However, the biosphere and its altered form — the noosphere — remain neglected as integral formations.

The processes occurring in the biosphere modified as a result of human activity can cause changes in the physical and functional state of a person. The necessity arises for the study of the noosphere processes affecting the human morphofunctional state that results in their chronic fatigue.

THE AIM

The objective of the article is to demonstrate the need to study various aspects of human existence with due account for the processes occurring in the biosphere; to

reveal the dependence of modern human chronic fatigue emergence and development on the processes occurring in the noosphere.

The research tasks are: 1) to characterize the process of the biosphere transformation into the noosphere on the basis of the analysis of V. Vernadsky's scientific developments; 2) to find out the processes of the noosphere formation in the conditions of the post-industrial society rapid transition from the information society stage to the knowledge society stage and the rapid development of the latter; 3) to distinguish the noospheric processes adversely affecting human health; 4) to generalize the results of scientific research in the context of psycho-physiological mechanisms of chronic fatigue formation and development; 5) to reveal the essence of the phenomenon of "noospheric processes anthropoprice"; 6) to find out the factors slowing down the chronic fatigue development under the noospheric processes conditions.

MATERIALS AND METHODS

A complex of methods was used in the research: general scientific (theoretical analysis, synthesis, comparison, correlation, systematization, generalization) and empirical (observation, conversation, questionnaire) with the use of subjective state diagnostic technique of "WAM" (V. Doskin, N. Lavrentjeva, V. Sharai, M. Miroshnikov, 1973) intended for the qualitative subjective evaluation of three main functional psycho-emotional human states — well-being, activity and mood — at the moment of examination. The research was conducted within the framework of "Axia" international project.

Respondents of three age groups were involved in the research, 347 people in each group. The first group included the responders aged 14 to 19; the second group included the responders aged 19 to 35; the third group consisted of the respondents aged 35 to 60. The respondents were divided into the age groups as recommended by the psychologist E. Erikson [1].

RESULTS AND DISCUSSION

The notion of "noosphere" was introduced into the scientific discourse by Le Roy [2]. It combines the words "nous" (the Greek for "mind") and "sphere" (meaning the "Earth's envelope"). The term "noosphere" was introduced into the scientific discourse in the early 20th century by V. Vernadsky who was exploring the biogeochemical foundations of the biosphere and individuated a separate scientific discipline of biogeochemistry from the geochemistry. In turn, the biogeochemical study of the biosphere served the investigation of biological processes in their elemental composition, since the subject of the study included geological life manifestations in the biosphere and biochemical processes inside the organisms inhabiting the planet.

As defined by V. Vernadsky, the biosphere is presented in biogeochemistry as "a peculiar Earth's envelope, clearly distinct on our planet, consisting of some concentric contiguous formations surrounding the whole Earth, called geospheres. The biosphere has possessed this perfectly definite structure for billions of years. This structure is connected with the active participation of life" [3, p. 137]. According to the scientist, the living matter of the biosphere is a carrier and generator of free energy called biogeochemical energy. This type of energy filling the entire biosphere not only causes the migration of chemical elements, but also dramatically changes their intensity, and therefore generally determines the history of the development of the biosphere, its geological significance and serves as the basis for the transition to the noosphere. In the context of this process human being is considered as a defined function of the biosphere in its defined time space and as a designated regular part of the structure of the biosphere, which will inevitably transfer (one way or another, sooner or later) into the noosphere.

The biosphere transformation into the noosphere occurs during the scientific thought "boom", that is its rapid growth, the development of science and social labor, based by the humanity on scientific results. According to

V. Vernadsky, the noosphere is a "biosphere elaborated by the scientific thought that has been prepared for hundreds of millions, or perhaps billions of years, in the process created by Homosapiens. Without stopping and without moving backwards, the process of biosphere transition into noosphere slows down or speeds up in case of a scientific thought «boom»" [4, p. 56].

Under the conditions of the information society development the noosphere is characterized by the absence of time and spatial boundaries, and innovative information and communication technologies provide new opportunities for the "boom" of the 21st century scientific thought and the extension of scientific results to the cultural, industrial, socio-economic and political processes of regional, state and planetary scale.

Noospheric processes are followed by: life pace acceleration, work execution in a compressed time frame, high density of information signals, high responsibility for the quality of work performed, urbanization, information pressure, stress, psychic tension aggravation, adynamia, high labor intensity, tension due to the choice of challenge implementation ways, etc. The stated processes affect the morpho-functional state of human body regardless of their age, gender, social and financial situation.

In the context of noospheric processes with the deficiency of proper rest, complete restoration of efficiency and body functional state a person suffers mental tiredness development, fatigue, chronic fatigue, chronic tiredness "build-up" resulting in chronic fatigue syndrome, burnout syndrome, etc.

According to H. Pyshnov, the occurrence of tiredness is characterized by "a set of temporal changes in the person's physiological and psychological state, developing as a result of intense or prolonged activity, that leads to the deterioration of quantitative and qualitative performance parameters followed by a decrease of the body functional reserves and is characterized by physiological functions discoordination and work physiological cost increase" [5, p. 8]. Scientists have found that the processes of tension and fatigue development occur in the human body with a certain synchronicity initiating each other. Herewith, the tension is aimed at the physiological processes intensification for the activity purpose implementation, and fatigue is targeted at the body functional reserves realization and the body preservation from excessive loads and exhaustion.

Excessive fatigue of systematic nature causes chronic tiredness (chronic fatigue). Herewith morphofunctional changes are observed building up in the human body over a long period of time (months, years) as a result of labor activity and are characterized by body functional reserves gradual exhaustion, stable systemic mental and physiological solaces of nonspecific nature.

In accordance with P. Anokhin's theory of functional systems, the following symptoms are observed during chronic fatigue formation period: 1) synapses hyperactivation (chronic fatigue development is followed by the formation of new neural connections providing morphofunctional alterations relevant to the load levels); 2) neuronal tissue

degeneration, neurons involution (there is an incoherence between the functional system neural organization and information load requirements).

In the context of the above it is significant to introduce the notion of the “*price of a certain activity*” regarding the “psychophysiological costs of internal resources at the expense wherewith a person performs this activity” [6, p. 4].

A. Karpukhina, V. Rozov [7] reveal the essence of the notion of “price” through the distinction of three concepts: personal “price” (determined by the changes in the person’s stable traits); perceived “price” (reflecting the degree of mental comfort-discomfort); 3) somatic “price” (physiological subsystems functioning indicator evident through various somatic symptoms and syndromes).

O. Kokun [8] describes the concept of “*adequate price*” as an optimum ratio between the activity effectiveness and the cost of the human body psychophysiological resources. An increase of the adequate “price” evidences the activity efficiency preservation at the expense of the body psychical and physical reserves exhaustion, increase of the efficiency restoration period to the normal level that can lead to health deterioration and various diseases occurrence.

The introduction of the notion of “*noospheric processes anthropoprice*” into the scientific discourse is substantiated by the necessity to explain various manifestations of (optimal, long-term, excessive) human body internal resources psychophysiological cost under the conditions of scientific thought “boom” and the subsequent biosphere intensive elaboration by the scientific thought.

The noospheric processes anthropoprice is characterized by two indicators: 1) optimal; 2) excessive. In the vast majority of cases the noospheric processes anthropoprice is excessive as it causes long-term and undue psychophysiological costs of the human body internal resources caused by the phenomenon called “human gap” by B. Sitars’ka [9]. The phenomenon essence is in permanent retard of the person’s acquired knowledge and skills from the pace and effects of changes occurring in the society.

The changes of the human body resulting from long and excessive psycho-physiological costs of its internal resources were investigated by H. Pyshnov. The scientist pointed out that “for the professional activity under the conditions of chronic fatigue development the human body synthesizes new functional systems formed through neural paths reorganization through one of two non-specific mechanisms: of “moderate” type (the body still has functional reserves allowing to maintain certain psychophysiological functions at a high level); “expressed” type (the body functional reserves are mostly decreased, and the levels of all psychophysiological functions become lower) [5, p. 23].

According to the results of O. Yeshchenko’s investigation, 40% of respondents smoke 0.5 pack of cigarettes a day, and 20% smoke 1 to 2 packs. The above confirms “the existence of acute need for the body artificial stimulation to overcome fatigue or stress” [10, p. 7]. Other scientist’s findings also attract the attention, in particular those stating that the condition of low mood, sadness and apathy cause addiction

to unhealthy habits, which, in turn, indicates decrease of the body’s resistance to environmental exposure.

H. Zaikina [11] pointed out that the increase of the specific weight of emotional instability cases and marginal neurotic disorders indicates over-strain caused by increased information load; hence consequent body exhaustion resulting from pronounced fatigue.

According to M. Antropova and V. Kozlova’s theory mental fatigue development caused by over-strain of the main regulatory systems affected by mental load is evidenced by a decrease in mental performance efficiency combined with diurnal adaptability low negative value [12].

Considerable researchers’ attention is given to the issue of the human body internal resources psychophysiological cost reduction under the conditions of modern society. Scientific works propose various approaches, such as: mental activity efficiency forecasting with the use of psychophysiological rating based on the individual typological personal qualities [13]; mathematical calculation of potential of cardiovascular system adaptation to mental load [14]; determination of types of human body response to information load according to the results of heart rate variability spectral analysis [15]; determination of desadaptive body disorders under industrial stress conditions on the basis of the fatty acids ratio in human sweat.

The results of the investigation performed by the authors of the article showed that the presence of a certain indicator of noospheric processes anthropoprice (optimal, excessive) depends on three factors: 1) orientation towards life-long learning (presence/absence); 2) level of life-long learning (active/passive/situational active-passive); 3) life-long learning attribution to certain components of the human psychic phenomena world (personal values /internal motives/external motives).

Respondents aged 14 to 19 (Group I), 19 to 35 (Group II) and 35 to 60 (Group III) were involved in the experimental investigation. The analysis of the respondents’ body functional state was performed with the use of subjective state diagnostic technique of “WAM” (hereinafter referred to as the “«WAM» method”). The obtained results were used to calculate the indexes of well-being, activity, mood and for the respondents’ subjective state integral assessment.

The cross-correlation analysis conducted allowed to establish the dependence of the positive subjective state integral assessment of three groups of respondents (regardless of their age) on the following: orientation towards life-long learning; active level of life-long learning; life-long learning attribution to personal values. It should be emphasized that virtually the same results were obtained for the respondents from the three groups, so henceforth we will refer to the average data fully regarding each of the three groups of respondents.

As Figure 1 shows, the above-mentioned correlation was established for 6.1% of respondents. According to the results of the “WAM” method, these respondents showed positive subjective state integral assessment. On the basis of the obtained results they were united into a group called “optimal noospheric processes anthropoprice”.

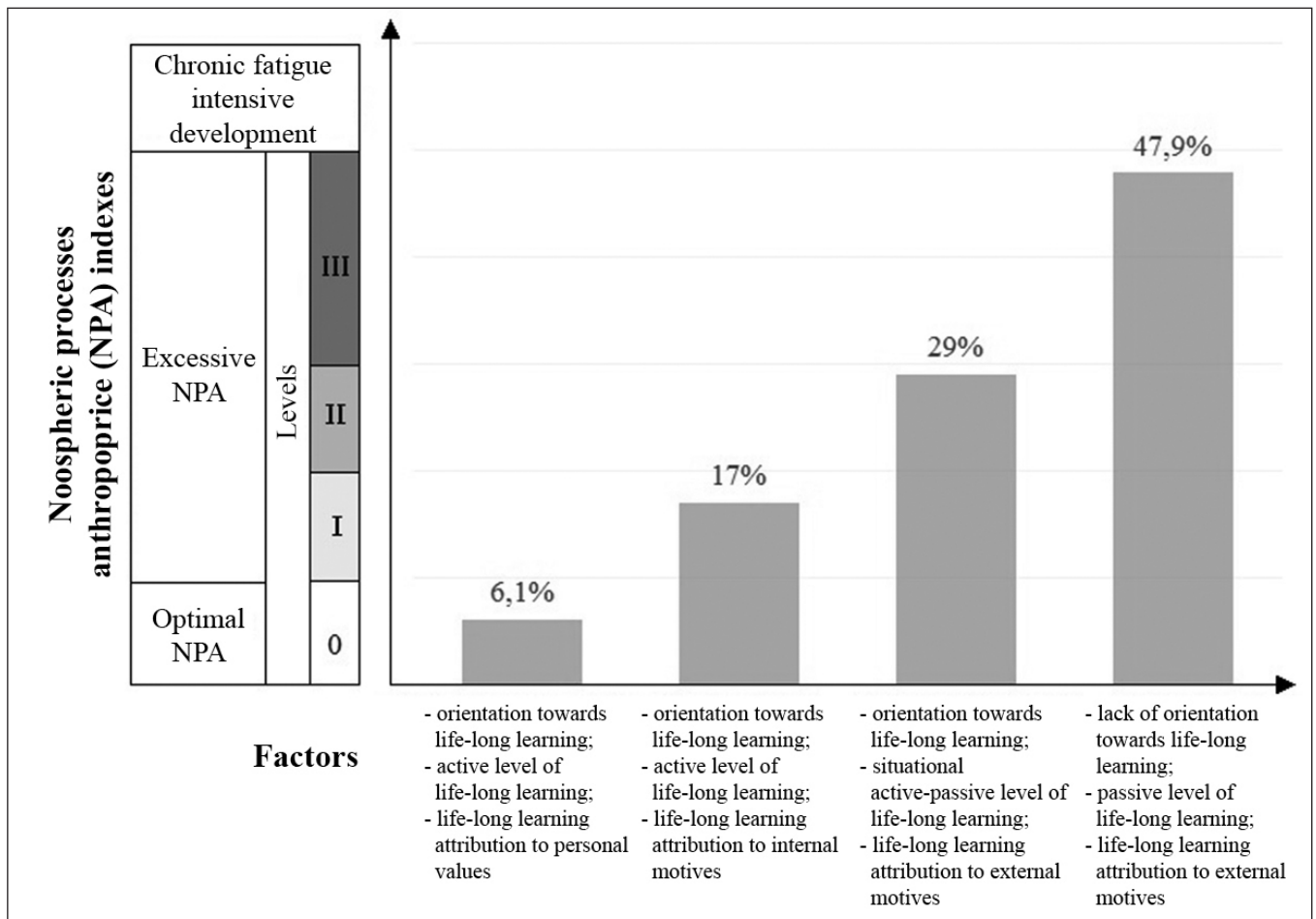


Figure 1. Respondents classification pursuant to noospheric processes anthropoprice in accordance with the indicators (optimal, excessive) and factors (orientation towards life-long learning (presence/absence); level of life-long learning (active/passive/situational active-passive); life-long learning attribution to certain components of the human psychic phenomena world (personal values/internal motives/external motives)).

As to 17% of respondents (“first-level excessive noospheric processes anthropoprice” group) — orientation towards life-long learning; active level of life-long learning; life-long learning attribution to internal motives. The integral assessment of the subjective state of this category of respondents revealed a decrease of well-being indexes against the background of activity demonstration and psychological states fluctuations (from enthusiastic to working state, and then to fatigue).

29% of respondents (“second-level excessive noospheric processes anthropoprice” group) demonstrated orientation towards life-long learning; situational active-passive level of life-long learning; life-long learning attribution to external motives. The results of the integral assessment of the subjective state of this category of respondents showed significant decrease of well-being indexes against the background of activity fluctuations (active-passive-active) and pronounced psychological states transitions (from working state to depression, and then to fatigue).

47.9% of respondents (third-level excessive noospheric processes anthropoprice) showed the lack of orientation towards life-long learning; passive level of life-long learning; life-long learning attribution to external motives. The integral assessment of the subjective state of this category

of respondents showed low well-being indexes against the background of passivity and accelerated psychological states transitions (from the working condition caused by the actions of others to fatigue).

The investigation results also showed that 6.1% of respondents attributed new knowledge acquisition to personal values. The conversations with these respondents revealed that new knowledge attribution to personal values resulted in motivation to succeed during any activity performance. The sensation of success approach slowed the occurrence of tiredness, thus increasing the duration of optimal efficiency and optimal strain. Other respondents attributed to personal values: self-development (32% of respondents aged 14 to 19); learning (30% of respondents aged 19 to 35); work (87% of respondents aged 35 to 60). These respondents were internally motivated to avoid failure in the activities performing process, which, in turn, expedited the occurrence of tiredness and increased the strain during the activity performance.

CONCLUSIONS

On the basis of the scientific literature analysis it was determined that the noosphere is the biosphere elaborated by

the scientific thought. Noospheric processes are followed by such processes as: life pace acceleration, work execution in a compressed time frame, high density of perceived signals, high responsibility for the quality of work performed, urbanization, information pressure, information stress, aggravated psychoemotional tension, high labor intensity, etc.

The notion of “noospheric processes anthropoprice” was introduced into the scientific discourse, the essence whereof the authors explain as the manifestation of (optimal, long-term, excessive) human body internal resources psychophysiological cost under the conditions of scientific thought “boom” and subsequent biosphere intensive elaboration by the scientific thought. The noospheric processes anthropoprice is characterized by two indicators: optimal; excessive.

According to the investigation results the dependence of the person's subjective state positive integral assessment regardless of their age on orientation towards life-long learning, active level of life-long learning, life-long learning attribution to personal values was established.

It was scientifically proven that excessive noospheric processes anthropoprice is observed in the cases when: 1) a person demonstrates orientation towards life-long learning, shows activity aimed at life-long learning, attributes life-long learning to internal motives; 2) orientation towards life-long learning, situational active-passive level of life-long learning, life-long learning attribution to external motives are observed; 3) lack of orientation towards life-long learning, passive level of life-long learning, life-long learning attribution to external motives.

It has been proven that chronic fatigue development under the conditions of noospheric processes is significantly slowed down if the modern human are oriented towards life-long learning, demonstrate activity aimed at constant new knowledge acquisition, level life-long learning up to the rank of personal values.

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