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ANALYSIS OF THE FORMATION AND DEVELOPMENT PROSPECTS OF PSYCHOPHYSIOLOGY

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The work is devoted to the development history and current state of psychophysiology all over the world, and particularly in The Republic of Armenia. The work is aimed at the pointing out the development intentions of psychophysiology all over the world and in Armenia. The purpose of the analysis was also to identify the main stages in the formation of psychophysiological science in Armenia and to search for scientifically applied prospects for its development. The establishment and tendencies of psychophysiology, as a separate and independent direction in worldwide science were discussed. The development importance and necessity problems of psychophysiology in Armenia were presented in details as well. The scientific problems were presented, which are directed to be solved both worldwide and in Armenia.

Key words: *Armenian psychophysiology, historical essay, science, education, training, formation stage, development*

АНАЛИЗ ФОРМИРОВАНИЯ И ПЕРСПЕКТИВ РАЗВИТИЯ ПСИХОФИЗИОЛОГИИ

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Работа посвящена истории развития психофизиологии, а также ее современному состоянию в мире в целом и, в частности, в Республике

Армении. Целью работы явилось указать тенденции развития психофизиологии в мире и в Армении. Целью анализа также явились идентификация основных стадий формирования психофизиологической науки в Армении, а также поиск научно-прикладных перспектив для ее развития. Обсуждаются процесс становления психофизиологии и тенденции в интернациональной науке как отдельное и самостоятельное направление. Также подробно представлены вопросы важности и необходимости развивания психофизиологии в Армении. Приведены научные проблемы, решению которых направлены психофизиологические исследования сегодня как в целом мире, так и в Армении.

Ключевые слова: *Армянская психофизиология, исторический очерк, наука, образование, обучение, стадия формирования, развитие.*

ՀՈԳԵՖԻԶԻՈԼՈԳԻԱՅԻ ԶԵՎԱՎՈՐՄԱՆ ՎԵՐԼՈՒԾՈՒԹՅՈՒՆԸ ԵՎ ԶԱՐԳԱՑՄԱՆ ՀԵՌԱՆԿԱՐՆԵՐԸ

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Աշխատանքը նվիրված է հոգեֆիզիոլոգիայի զարգացման պատմությանը և ներկայիս վիճակին աշխարհում և մասնավորապես՝ Հայաստանի Հանրապետությունում: Աշխատանքի նպատակն է մատնանշել հոգեֆիզիոլոգիայի զարգացման միտումները ողջ աշխարհում և Հայաստանում: Վերլուծության նպատակն է նաև նույնականացնել հոգեֆիզիոլոգիական գիտության ձևավորման հիմնական փուլերը Հայաստանում, ինչպես նաև փնտրել գիտականորեն կիրառելի հեռանկարներ նրա զարգացման համար: Քննարկված են հոգեֆիզիոլոգիայի կայացման ընթացքն ու տենդենցները համաշխարհային գիտության մեջ, որպես առաձին և ինքնուրույն ուղղություն: Մանրամասն ներկայացված են նաև Հայաստանում հոգեֆիզիոլոգիայի զարգացման կարևորության ու անհրաժեշտության հարցերը: Բերված են այն գիտական խնդիրները, որոնց լուծմանն ուղղված են այսօր հոգեֆիզիոլոգիական ուսումնասիրությունները ինչպես ողջ աշխարհում, այնպես էլ Հայաստանում:

Հանգուցային բառեր՝ *Հայկական հոգեֆիզիոլոգիա, պատմական ակնարկ, գիտություն, կրթություն, վերապատրաստում, ձևավորման փուլ, զարգացում*

Nowadays Discipline of psychophysiology continues prosperously developing all over the world as well as in The Republic of Armenia. This is a direction, which is considered to be young all over the world, including Armenia. The basis of psychophysiology development goes far to 5th century BC, when Plato (428-347 BC) put the following insights at the basis of human activity – the reason and perception in head, inferior passion in liver as well as greed and desire in intestines. Meanwhile, today Plato is considered to be the founder of dualism in psychology. Later, his student – Aristotle (384-322 BC), elaborated the thesis that the soul and body are unified; he assumed the existence of three-dimensional structure of anima (soul) – those are herbal (growth providing), animalistic (motion providing) and thinking (human intelligence) parts. Parallel to Aristotle, Herophilus (335-280 BC) started studying nervous system, insisting that the nerves are mobilized in the spinal cord, not in muscles and skin. Further, in the 2nd century BC we may see some psychophysiological thoughts in Galen's (201-129) works, where behavior changes of gladiators were described as a result of head damages. For the first time it was mentioned that the brain is connected to the mental activity [3,5].

Moving to AD we can mention about Nemesius, who spoke about the responsibility of each of brain ventricles for various functions, including recognition [4]. Some psychophysiological representations were appeared in Ibn Sina's (Avicenna) (980-1037 AD) works [6]. His works were connected to medical psychology, where the emotionality takes a special place in organism behavior control. Following the chronology, let's move to the 15th century, when Descartes (1596-1650) compared the human organism activity to technical device; he considered that animals do not have a soul and he observed their behavior as a response reaction to changes of environmental conditions. He was the first scientist, who spoke about the terms of reflex and consciousness – underlying the reflector mechanisms of animal activity and implementations of human simple action. The consciousness he considered to be a tool of self-observation. In actual, Descartes continued developing the dualism theory. Later in 17th century Spinoza (1632-1677) tried to unify the human soul and body, assuming that a human being has three main moving forces – sadness, joy and drive. Already in 18th century Thomas Willis (1660-1715) mentioned for the first time that the cerebral cortex is responsible for implementation of a number of functions. In the beginning of 19th century Joseph Gall developed the theory, insisting that the cerebral various regions are responsible for different cognitional processes. In contrast, Florence insisted that the mental

work depends on the brain global activity. It was considered that since the half of 19th century the golden years of psychophysiology development have started, when Broca and later Wernicke discovered speech centers.

At the beginning of 20th century it should be mentioned about Armenian Great scientist L.A. Orbeli (1882-1958), who hugely contributed to physiology development. Particularly, he developed Pavlov's (1849-1936) theory, referring to supreme nervous activity; besides Orbeli was considered to be the founder of evolutionary physiology. He also had valuable works in the sphere of cerebellum physiology and showed that the organism reflector control is implemented mainly due to the suppressor function of cerebellum.

One can note that L. Orbeli together with A. Ginetsinskii described a phenomenon, indicating that the tiredness of skeleton muscle, appeared as a result of long contractions, was possible to eliminate by sympathetic nerve excitation in frog. Revelation of this phenomenon created new theory, which indicates the adaptation-nutritional function of sympathetic nervous system. It was revealed that humoral controlling mechanism lies at the basis of Orbeli-Ginetsinskii phenomenon, which is connected to secretion of catecholamine from vasomotor nerve that in turn appears at the excitation of sympathetic nerve [8].

However, for the first time the term "psychophysiology" was used by N. Masias as a study of psychological activity, based on physiological methods [5,6]. Furthermore, the works of Wundt, Berger, Sechenov and Pavlov had a great value in psychophysiology development [6]. Luria hugely contributed to psychophysiology development, who in fact was considered to be the founder of neuro-psychology [5,6]. He treated the structural-functional model of the brain as a material basis of psychological activity and divided the brain into three big functional blocks. The development of psychophysiology gained to its maximum, when in 1960s the methods of electrocardiograms, electroencephalograms, induced potentials and magneto-resonance tomography were developed.

Finally, psychophysiology gained its official status as a separate discipline in May 1982, when in Monreal the first congress of psychophysiologicalists took place, during what the international psychophysiological association was founded, which successfully acts to date. After this event the psychophysiological works have prospered all over the world.

Moving on to Armenia and trying to speak about psychophysiology development in the Republic of Armenia, we should begin from the works of professor V.H. Grigoryan (Doctor of biological sciences), who was the founder and maker of psychophysiological school in Armenia. The works of prof.

Grigoryan started from the Institute of Physiology named after L. Orbeli, where she for the first time in 1974 applied the non-invasive psychophysiological method – registration of induced optical potential from human intact brain surface. Later prof. Grigoryan founded scientific-research group, implementing psychophysiological studies in the Department of human and animal physiology at The Yerevan State University. Since 1978 the cycle of lectures started at The YSU and the lecturer was prof. Grigoryan, who read them for biologist and psychologist students. It should be mentioned that prof. Grigoryan brought up a whole generation, who successfully continue the studies in this sphere up to date. In the laboratory, founded by her, in the Faculty of Biology there have been carrying out the studies, devoted to the actual themes, such as the examination of human psychophysiological state, while sitting in front of computer during the whole day. As today our routine indicates, it is very actual problem, since eight-hour or often longer working day of many people is connected to only computer, spending the whole day in front of which, a person acquires an altered psychophysiological state, since the medium is changed and the person does not have an opportunity to behave himself as a usual living organism, which is on the top level of evolution. This fact, in turn, dictates physiological and consequently psychological alterations that we can see reflected on both human health and behavior. People become more silent, isolated, self-absorbed, avoid other people friendship, and feel uncomfortable in crowd and continuously try to be separated with their computer. In this case there is no need to mention about the fact that motoric apparatus suffers, muscular weakness develops – the problems of bones and particularly spinal cord appear, obesity comes with all negative consequences – deviations of cardiovascular, digestion, excretory systems, etc. On the other hand, we do not speak about electromagnetic irradiation from computer. Indeed, nowadays monitors are more protected, compared to those 20-25 years ago, but in any case the problem exists. In this situation it is very important to find out the psychophysiological changes of person and their effect on his further life quality. These questions were deeply and seriously studied by prof. Grigoryan and his PhD students, who have done their PhD works in this field [4]. Except the computers, today our life is full of different devices, working in the interval of radio-waves, without which we cannot imagine our life. This problem derives a new direction in international science – the studies on the effect of radio-waves on biological systems, being on different levels of organization [12]. The works revealed that, for example, cellular phones work by the waves with the frequency 2.45 GHz that certainly affect our brain. Especially it is advised to keep farther the phone from the

head, while sending or accepting the call, until the answer. On the other hand, the usage of gadgets tonight, before the sleep, light etc. has unfavorable impact on our nervous system, particularly on the brain. These all, seemingly routine events affect the human, inducing psychophysiological pathologies, neurosis, stress, deterioration of internal organ functions etc.

Speaking about psychophysiology development in Armenia, it is worthwhile to mention about Armenian Great Physiologist E. Hasratyan (1903-1981), who developed the theory of Pavlov in the sphere of supreme nervous systematization and discovered the regularities of conditional reflex systematization, bilateral character of conditional bonds, as well as internal inhibition mechanism localization in reflector arc[§].

To date the students of the faculties of Biology as well as Philosophy and Psychology of The YSU listen to the lectures on the discipline of Psychophysiology that are read by Associate Prof. L.S. Stepanyan at the Faculty of Philosophy and Psychology [13]. Moreover, at the Chair of General Psychology the psychophysiological studies have been carrying out, dedicated to the investigation of controlling mechanisms of human working ability preservation in stress conditions, when vegetative criteria are measured [1,2]. It should be noted that the Chair recently has acquired the device, called "Feedback", through which it will be possible to implement various psychophysiological studies. Particularly, it will be possible to register and quantitatively estimate the states, referring, for example, to student stress before and after examines, to preparing to them, to positive emotions during different student measures etc. Recently after the war plagued the Republic of Armenia, the whole population was subjected to big stress, which has been leaving its changed psychophysiological image in parents and, particularly, in returned soldiers. In this field a huge psychological work has been done by the Chair of General Psychology of The YSU with its professor-lecturer staff. Due to this work, it was and will be possible to rectify the emotional background of these people, their psychological health, which is tightly connected to the physical health.

Besides The YSU, today in the Republic of Armenia there exist many other hearths, where similar studies are implemented. Among them there should be mentioned the laboratory of human psychophysiology at the scientific-research Institute of Physiology of NAS RA after L. Orbeli, where the works have been carried out in studying of human brain functional state. The connections

[§] Hasratyan E.H. Actual problems of congitional reflex functioning. 1988, Yerevan, NAS of Armenia USSR.

between the brain regulatory mechanisms and their biorhythm structure, as well as the brain functional possibilities and psychophysiological and vegetative processes are studied. There also are investigated the possible combinations between human brain functional state and different modality sensor signal effects, as well as there are elaborated effective methods to diagnose various psychophysiological diseases [9]. The laboratory head is A.S. Khachunts, who is a candidate of biological sciences.

Valuable psychophysiological school is present also in The Armenian State Institute of Physical Culture and Sport, the founder of which was R.K. Haroutyunyan – doctor of biological sciences. The main directions of the studies have included macro- and micro-adaptation fields of humans, especially sportsmen in different conditions, e.g. at hypoxia [7,15,16].

Actually, today the discipline of psychophysiology is taught in almost all educational institutions of various profiles (Academy of Public Administration, Russian-Armenian University, Armenian State Pedagogical University after Kh. Abovyan etc.). Thus, it should be also mentioned about the psychophysiological studies, directed to the assessment of the brain state throughout the bloodstream rate, measured by ultrasonic and Doppler techniques as well as the role of peptide mediators in optimization of the brain functioning. These studies have been carried out by prof. A. Lokyan and his group [10,11].

In the majority of psychological centers, acting in Armenia, psychophysiological services today are supplied, including in “Ayg”, “APAGA (Future)” and “Aura” psychological centers, psychological center, “Goy” psychological center, “MP” and “Gesture” psychological center, “Hylyphman” psychological services, “Yoga-Home” respiratory psychotherapy scientific-research center etc. Meanwhile, such services are supplied by the device of “Bio-Feedback”, i.e. according to the human emotional state the physiological state changes of humans are determined**.

The fundamental research of M. Zotov reveals the understanding of such fundamental problems of psychophysiology and clinical psychology as the problem of cognitive-affective interaction, the psychophysiological problem and the problem of the correlation of conscious and unconscious components of human cognitive activity. So, this fact should contribute to scientific research and comprehensive psychophysiological measurements of brain activity in various conditions of human activity [17]. In a more modern article, it is clearly stated that input from cognitive neuroscience and psychology, on multiple levels of analysis, cohere in supporting the distinction between two separate

** <https://www.pages.am/hy/hogebanakan-kentronner/>

forms of knowledge. Thus, one can conclude that the result is a neuropsychologically plausible understanding of knowledge [14]. A purely scientific approach to research on the biofeedback device is being developed at the YSU Psychology Research Center within the framework of the project: “The contribution of data of theoretical and practical importance to academic and public platforms through new research in the field of psychology”.

Modern trends in psychophysiology are associated with the study of the mechanisms of a wide range of cognitive processes, consciousness, cognitive control and links with the psycholinguistic apparatus.

Summarizing the aforementioned, one can insist that today the discipline psychophysiology in Armenia is being developed, though, this development not only is connected to fundamental science, but also has application perspectives, since in practice it is applied to heal people psychologically and medically. Particularly, there are many actual topics, including the estimation possibilities of stress conditions as well as the reasons, resulting in such conditions, for instance, spending much time in front of computer; evaluation of brain functional state, using various sensor measures and finally diagnosis of psychophysiological diseases. Psychophysiology has endless opportunities and strictly actual and important necessity to be studied, since, in fact, there is studied the most important thing – human behavior, on the basis of changes of physiological criteria.

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