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Neurophysiological Aspects of Natural Science Training of Future Psychologists in Higher Education Institutions in Finland and Sweden

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Abstract: *The relevance of the study of the natural science training of future psychologists for the presence of neuroscientific knowledge in the content of education lies in the fact that neurosciences have penetrated all spheres of socionic areas of training and are a synergistic component for the humanitarian aspects of human psychology. The aim of our article is to investigate the content component of psychological education in the universities of Finland and Sweden in order to determine its relevance to the modern interdisciplinary humanities and natural sciences paradigm, in particular the application of neuroscience in the training of psychologists. It was found that the neurophysiological aspect of psychological education (in parallel with the environmental) at the universities of Finland and Sweden is implemented through the implementation of disciplines, focused on the study of the neurophysiological nature of higher nervous activity (compulsory disciplines) and mainly neurophysiological diagnostic and cognitively oriented selective disciplines. There is a difference in the approach to planning the training of future psychologists: in Finland, lists of variable disciplines are approved, in Sweden only compulsory subjects are regulated, and in the variable component students have full academic freedom. It has been established that higher psychological education in Sweden and Finland is fully consistent with the tendencies of today's society, in which there is a "blurring" of boundaries between scientific fields and an orientation towards building a student's personal educational space.*

Keywords: *compulsory disciplines, academic freedom, elective courses, additional courses, psychophysiological mechanisms, neurobiology, neuropsychology.*

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Introduction

Today's approach to the training of psychologists, sociologists, teachers, and other specialists in liberal professions is now undergoing profound transformations.

Martynenko (2013) singles out the defining criteria of vocational education within the Bologna process, namely: "creation of a single pan-European space in the field of higher education for harmonization of national educational systems and strengthening of trust between subjects of education; increasing the mobility and compliance of students, teachers and citizens with the European labor market; compatibility of qualifications at the university and postgraduate stages of training". This approach makes it relevant to study and compare the content of university education in individual countries and assess such content in accordance with the requirements of post-classical education, in which there is a close interdisciplinary relationship in most humanities and natural and technical areas of training.

In the light of a new educational, social and even cultural paradigm, the psychological and neurophysiological features of the subjects of social activity come to the fore. Thus, neuroscience becomes an integral component not only of psychological education, but also a tool for human knowledge of themselves, their capabilities and intentions. Thus, Randolph, McCrea, & Barr (2005) believe that the psychology of activity management, which contains stressors (sports, education), especially when it comes to the emerging personality, should constantly rely on neuropsychological diagnosis of destructive influences. This forces us to pay more attention to the biological basis of higher mental processes in the training of future psychologists.

Neurosciences are extremely congruent with today's tendencies in education, in particular performativity as a cross-cutting method of learning and individual synthesis and production of new knowledge within personal educational and life trajectories. This applies primarily to the humanities. The latter almost abandoned reproductive learning, which was based on the current mechanisms of perception, understanding and memory (Trifonas, 2003). For example, teachers' ignorance of the neuropsychological mechanisms of mental activity leads to the fact that teachers pay excessive attention to one of the cognitive processes. For example, it was previously believed that the acquisition of knowledge and training of memory should automatically improve the personality as a whole (Sala, & Gobet, 2017). This is a typical mistake caused by a misunderstanding of the integrity and

multilevel nature of the human neural system, in which sensory, kinesthetic, intuitive or other neural channels of reality are equally important, although they vary depending on the phenotype and lateral profile. This fact highlights the relevance to studying neurophysiological aspects of natural science training for future psychologists.

From the beginning of the XXI century, in connection with the needs of the humanities and medical sciences, the neuroscientific foundations of mental processes began to develop actively. There are three areas: general methodological and theoretical foundations of neuroscience (Bagozzi, & Lee, 2017), neurophysiological nature and connection of mental processes and phenomena (motivation, memory, thinking, behavior, decision making) (Baddeley, 2017) and neurophysiological the nature of psychological disorders within the neurological norm (deviant behavior, addictions) and pathology (cerebral disorders, developmental delays, etc.). However, the latter aspect is not separated from the previous ones, as functional neurological disorders can manifest themselves as neurotic: addictive, compulsive, risky behavior (Ross, Duperrouzel, Vega, & Gonzalez, 2016). Such trilateral researches in a complex can serve in psychology not only for therapy, but also preventive activity on the prevention of behavioral aberrations, spontaneous decisions, attacks of affect; allow to model psychotherapeutic process on many initial parameters.

On the positive side, since the 2000s, a common interdisciplinary categorical apparatus and non-medical research methods have been gradually developed and become established for psychology, sociology, pedagogy, and neuroscience (Becker, 2014).

For a long time, clinical and counseling psychology used only non-medical methods in diagnosis - conversation, testing, observation. This has always made it difficult to identify nosological units that are on the brink of psychology and neurology or psychiatry. Later it became clear that such disorders, although they can be corrected with the help of psychotherapy, are still more sensitively determined when measuring neurophysiological and often visceral parameters (Słoniak, 2012). This led to the interpenetration of psychology, correctional pedagogy on the one hand and on the other-neurophysiology.

Subsequently, in the correction of conditions and diseases on the verge of neurotic and psychotic disorders, in the planning of rehabilitation and corrective measures increasingly began to use neurophysiological parameters, which significantly expanded the range of medical and psychological history. Therefore, not only medicine, but also socionymic

practices (psychological counseling, coaching, social support) began to be accompanied by neuropsychology (Voigt, 2019).

The above trends make relevant the problems of studying neurophysiological aspects in the context of natural sciences at the faculties of training of psychologists, which lays the foundations of a multimodal psychological and physiological approach in future professional practice.

Therefore, the *purpose of our article* is to study the content of psychological education for the presence of natural science training and its neurophysiological aspects. In particular, the object of study was higher psychological education in Finland and Sweden as countries that are demonstrating a rapid entry into the latest educational and scientific space.

Given the above, we consider it appropriate in our study to determine the state of implementation of natural science training of future psychologists in leading universities in Finland, namely: Jyväskylän Yliopisto / University of Jyväskylä, Turun Yliopisto / University of Turku and Itä-Suomen Y University Eastern Finland.

Training of future psychologists in higher education institutions in Finland

Finland has long established itself as a country with a very high level of higher education. Higher education institutions in this country are represented by 20 universities and 29 institutes with state status and a high level of autonomy. Interestingly, their autonomy is manifested, starting from decisions on enrollment of students for study, approval of curricula and extends to the rules for obtaining scientific degrees (Zhernokleev, & Pushkarova, 2006). It is the high level of autonomy that allows the scientific and pedagogical staff to vary the content of psychological education in the direction of biological, in particular neurophysiological aspects.

Jyväskylän Yliopisto / University of Jyväskylä is one of the most famous multidisciplinary higher education institutions in Finland. There are 7 faculties in its structure, including Psykologian Laitos / Faculty of Psychology, where future psychologists are trained. Through various research programs, this university cooperates with almost 900 institutions of higher education in the world (Jabłoński, 2019). Research work in Finnish higher education institutions, according to Zhernokleev, & Pushkarova (2006), is compulsory because "according to Finnish law , higher education institutions should carry out practical training of students on the example of their own research and achievements. This helps to avoid theorizing in the study of natural sciences and link them directly to future psychotherapeutic practice.

An analysis of the curriculum for the training of future psychologists, which is located on the official website of the University of Jyväskylä, gives reason to note that natural science training in it is 30 credits, that is, 10% of the total volume (300 ECTS credits), namely: 15 credits a student receives as a result studying the required basic courses: "Anatomia ja fysiologia keskus- ja ääreishermoston / Anatomy and physiology of the central nervous system", "Kokeelliset neurobiologia menetelmät / Experimental methods in neurobiology", "Aivojen visualisoinnin perusteet / Basics of brain imaging" (Table 1) and 15 credits from the list of suggested selected disciplines: "Kognitiivinen neurobiologia käytännön harjoittelu / Cognitive neurobiological tutorial", "Kognitiivisen neurobiologia ajankohtaiset asiat / Actual problems of cognitive neurobiology", "Oppiminen ja muisti neurobiologia / Neurobiology of learning and memory", "Hermolihasjärjestelmän kinesiologia / Kinesiology of the nervous systems and", "Kognitiivisen neurotieteen menetelmät / Methods of cognitive neuroscience." (Table 2).

Table 1. Excerpt from the curriculum for future psychologists at Jyväskylän Yliopisto / Jyväskylä University (compulsory disciplines)

Code	*Pakolliset core-kurssit / Compalsory courses*	Credits	Semester
CIBA110	Anatomia ja fysiologia keskus-ja ääreishermoston / Anatomy and physiology of the central nervous system	5	1, 2
CIBA120	Kokeelliset neurobiologia menetelmät / Experimental methods in neurobiology	5	2
CIBA130	Aivojen visualisoinnin perusteet / Basics of brain imaging	5	2, 3

Table 2. Excerpt from the curriculum for future psychologists at Jyväskylän Yliopisto / Jyväskylä University (elective disciplines)

Code	*Valikoiva kurssit /Elective courses*	Credits	Semester
CIBA140	Kognitiivinen neurobiologia käytännön harjoittelu / Cognitive neurobiological tutorial	5	1–10
CIBA160	Kognitiivisen neurobiologia ajankohtaiset asiat / Current problems of cognitive neurobiology	5	1–10
CIBA170	Oppiminen ja muisti neurobiologia / Neurobiology of learning and memory	5	1–10

LBIP002	Hermolihasjärjestelmän kinesiologia / Kinesiology of the nervous system	5	1–10
CIBA213	Kognitiivisen neurotieteen menetelmät / Methods of cognitive neuroscience	5	1–10
CIBA510	Aivotutkimuksen menetelmät / Brain research methods	5	1–10

After analyzing the curricula of the disciplines of natural science training defined in the curriculum, we conclude that most of them relate to the study of the neurophysiological nature of cognitive processes and diagnostic methods, and only some of them have a theoretical and educational nature.Thus, carrying out a detailed analysis of the course " Anatomia ja fysiologia keskus-ja ääreishermoston / Anatomy and physiology of the central nervous system", the authors of the curriculum emphasize that it is theoretical, so the teaching methods used only lectures, which highlight the basic principles structure and functioning of the human central nervous system: from the cellular to the systemic level. Upon completion of this course, students are expected to develop knowledge about the structural and functional organization of the central nervous system and understanding of the neurophysiological mechanisms of mental processes (Jabłoński, 2019).

The discipline "Kokeelliset neurobiologia menetelmät / Experimental methods in neurobiology" for future psychologists is mandatory for the study of theoretical and practical course and, according to the authors of the curriculum, should be studied by students of psychology after studying the course "Anatomia ja fysiologia keskus-ja äre and physiology of the central nervous system "/ Anatomy and physiology of the central nervous system" (Jabłoński, 2019). The program states that students should know the principles of experimental research in neurobiology, be able to receive and interpret neural signals and understand how the information obtained can be used in the context of future professional activities (Jabłoński, 2019). The value in the theory of the laboratory course "Aivojen visualisoinnin perusteet / Fundamentals of brain imaging", for which students will learn the basics of invasive and non-invasive methods of imaging human brain activity, is, according to the authors of the curriculum, undeniable, since at the end of the course, students realize the benefits and the disadvantages of each of the methods, know where they can be applied, and be able to interpret the results of the research (Jabłoński, 2019).

Elective disciplines on natural science training of future psychologists are offered, as noted by Aalto, & Suutama (2019), aimed at

deepening and generalizing the neurobiological knowledge acquired by students of psychology during the training of compulsory courses (Jabłoński, 2019). However, the curriculum developers emphasize that not all of them should be selected for study. In the explanatory note to the curriculum, Aalto, & Suutama (2019) indicate that students must choose at least 15 ECTS credits from the proposed list of subjects.

Consider the content of the science and education of the educational institution Turun Yliopisto (University of Turku), which is the second largest institution of higher education in Finland and, according to the Times, is one of the hundred best universities in Europe.

The training of psychologists at the University of Turku lasts for 5.5 years and involves the study of disciplines in the amount of 320 ECTS credits.

As can be seen from Table 3, the natural science training of future psychologists is represented by compulsory basic courses, namely: "Kognitiivisen neuropsykologian perusteet / Basics of cognitive neuropsychology" and "Biologisen tutkimuksen menetelmät psykologiassa / Methods of biological research in psychology", as well as elective courses "Ekologinen psykologia / Environmental psychology", "Oppiminen ja muisti neurobiologia / Neurobiology of learning and memory", "Aivo Tutkimuksen menetelmät / Methods of brain research."

Table 3. A fragment of the curriculum for future psychologists at Turun Yliopisto / University of Turku (compulsory disciplines)

Code	Disciplines	Credits	Semester
Pakolliset core-kurssit / Compulsory basic courses			
2240102	Kognitiivisen neuropsykologian perusteet / Fundamentals of cognitive neuropsychology	7,5	1, 2
2240152	Biologisen tutkimuksen menetelmät psykologiassa / Methods of biological research in psychology	5	2
Valikoiva kurssit / Elective courses			
2240160	Ekologinen psykologia / Environmental psychology	5	1–11
2240170	Oppiminen ja muisti neurobiologia / Neurobiology of learning and memory	5	1–11
2240510	Aivotutkimuksen menetelmät / Brain research methods	5	1–11

It should be noted that although the list of elective courses is much smaller than in the curriculum for future psychologists of the previously analyzed university, but the official website of the Department of Psychology at the University of Turku states that students can choose subjects covered by curricula of other faculties. , and in other institutions of higher education (Armstrong, 2006), and this significantly expands the list of elective subjects.

A detailed analysis of the curriculum for future psychologists at the University of Turku, in particular its section "Antama neuvonta ja ohjaus / Tips and Tricks", gives us reason to believe that, according to the authors of the proposed curriculum, the study of science will help future psychologists to deeply understand neurophysiological processes in neuroanatomical structures and sensory systems; will promote the development of skills to apply instrumental methods to study the physiological functions of the human brain and analyze the results; will teach them to draw conclusions and make the right, scientifically sound professional decisions, as well as to understand the impact of environmental factors on the mental health of the individual (Armstrong, 2006).

Psychology students at Itä-Suomen yliopisto / University of Eastern Finland, as well as at Turun Yliopisto / University of Turku, also last 5.5 years, but study 330 credits, as opposed to 320 credits reflected in the curriculum for future training. psychologists from the previously analyzed University of Finland.

As can be seen from Table 4, the natural science training of future psychologists is represented by one mandatory integrative course "Kognitiivisen neuropsykologian / Cognitive Neuropsychology". 15 EKTS credits are provided for its study during the first two years of study. The total amount of natural science training of future psychologists at the University of Eastern Finland, as stated in the "Suosituksia Opetussuunnitelmaan / Curriculum Recommendations", must be at least 25 ECTS credits. Therefore, students must receive 10 ECTS credits from the List of Elective Courses. It is worth noting that in accordance with the requests of students, the list of elective courses is updated at the university every year. The official website of the Department of Psychology at the University of Eastern Finland states that students can choose subjects that belong to the approved List of elective subjects both within their university and in other higher education institutions in the country and the world.

Table 4. A fragment of the curriculum for future psychologists at Itä-Suomen Yliopisto / University of Eastern Finland (compulsory disciplines)

Code	Disciplines	Credits	Semester
Pakolliset kurssit / Compulsory basic courses			
PSYS02	Kognitiivisen neuropsykologian / Cognitive neuropsychology	15	1, 2, 3, 4

A detailed analysis of the curriculum of the integrative course "Kognitiivisen neuropsykologian / Cognitive neuropsychology" suggests that its structure covers four modules, namely: "Hermoston anatomia / Anatomy of the nervous system" 4 ECTS credits, "Neuroanatomisten rakenteiden fysiologia / Physiology of structures 5 credits ECTS, "Henkisten prosessien geneettinen perusta / Genetic foundations of mental processes" 3 ECTS credits and "Ekopsykologia / Ecopsychology" 3 ECTS credits, which, in the opinion of the mentors of the training of future psychologists, will form students' understanding of the physiological and biochemical mechanisms of mental processes, knowledge of the meaning cerebral cortex and subcortical structures in the control of mental processes and the influence of heredity and environmental factors on the formation of psychophysiological characteristics of a person.

Thus, the analysis of the Finnish higher education system showed that the training of future psychologists in Finnish higher education institutions is carried out in accordance with the approved curriculum with compulsory subjects and disciplines of free choice, which prevail. Interestingly, in addition to the elective subjects proposed by the curriculum, students of psychology can independently choose to study natural sciences, which belong to the curricula of other faculties both within their educational institution and in other institutions of higher education.

Note also that in Finland, the scientific training of future psychologists is a mandatory component of psychological education. Each curriculum contains a justification for the introduction of a particular discipline, including science. All natural science disciplines covered by the training plans for future psychologists are closely related to the practical application of the knowledge gained during their study.

Analysis of the organization of natural science training of future psychologists in the leading universities of Sweden

Higher education in Sweden is characterized by a high level of quality and independence of the management of higher education institutions in the organization of the educational process, research and management. In total, there are about 55 higher education institutions in the country, of which 11 have the status of a university.

In Sweden, as in Finland, higher education is a degree, but the training of future psychologists in higher education is carried out on a continuous specialized five-year program, according to which students specialize in certain areas of psychology from the very beginning.

Let's analyze the organization of natural science training of future psychologists in the leading universities of Sweden, namely: Uppsala Universitet / University of Uppsala, Göteborgs universitet / University of Gothenburg and Stockholms universitet (2019) / Stockholm University.

Uppsala universitet / Uppsala universitet - the oldest university in Sweden and all of Scandinavia, has 9 faculties in its structure, including Samhällsvetenskapliga Fakultetsnämnden / Faculty of Social Sciences, where future psychologists are trained.

As a result of our research, it was found that the compulsory natural sciences, which are provided by the curriculum for future psychologists at Uppsala University include only two: "Biologisk Psykologi / Biological Psychology" and "Hjärna och Beteende / Brain and Behavior » (Table 5). For their study, 15 ECTS credits are provided, which is 5% of the total amount (300 credits).

Table 5. A fragment of the curriculum for future psychologists at Uppsala University (compulsory disciplines)

Code	Disciplines	Credits	Semester
Obligatoriska kurser / Compulsory courses			
2PP106	Biologisk Psykologi / Biological psychology	7,5	1; 2
2PS714	Hjärna och Beteende / Brain and behavior	7,5	3; 4

A detailed analysis of the målet / objectives, innehåll / content and förväntade / resultat expected results defined in the science curriculum indicates their professional use. Thus, the developers of the Kursplan för Biologisk Psykologi / biological psychology program note that after completing the course, the student should be able to: explain in detail the

anatomical structure of the human nervous system, the structure and functions of individual nerve cells, the mechanisms of intracellular and intercellular, both electrical and chemical transmission of excitation; describe the main stages of development of the human nervous system, starting from the embryonic period; taking into account the theory and conclusions about the development of the human nervous system, predict evolutionary prospects. In addition, the authors of the program argue, students should understand: how hormonal activity and biological rhythms can affect human behavior, for example, in relation to sleep, alertness and response to stress, as well as when and for what purpose it is advisable to use methods of physiological or structural measurements in brain research (Univerzita Palackého v Olomouci, 2017).

To achieve such results, according to the curators of the outlined training course, it is advisable to organize classes in the form of lectures, laboratory work and individual research. The learning outcomes indicated in the program are evaluated through final testing and on the basis of the defense of individual scientific research (Univerzita Palackého v Olomouci, 2017).

Analyzing the curriculum of the discipline "Hjärna och Beteende / Brain and Behavior", we came to the conclusion that this course is a logical continuation of the course "Biologisk Psykologi / Biological Psychology", because, according to its authors, aimed at in-depth and more detailed study of biological mechanisms of perception, memory, learning, emotions, language, sleep (Univerzita Palackého v Olomouci, 2017).

We consider it expedient to note that in the curriculum of training of future psychologists analyzed by us there are no selected disciplines. However, the instruction in the curriculum, which is available on the official website of the Institutionen för Psykologi / Department of Psychology, Uppsala University, states that knowledge of ej obligatoriskt / additional courses, including science, the student can get in two ways: either he chooses already existing courses at the university, or a group of students chooses the direction in which they want to gain in-depth knowledge, and together with the responsible teacher make a proposal for the curriculum, which is approved by the head of the department. The curriculum should contain: the purpose, objectives and content of the discipline, methods of teaching and diagnosing the acquisition of educational material, as well as a list of educational and scientific literature (Univerzita Palackého v Olomouci, 2017).

Göteborgs universitet / University of Gothenburg is the third oldest university in Sweden, with 8 faculties, including the Samhällsvetenskapliga

Fakulteten / Faculty of Social Sciences, which reports to the Institutionen för Psykologi / Department of Psychology.

Analyzing the curricula for the training of future psychologists at the University of Gothenburg, we found that natural science training is represented by three disciplines: "Kognitiv Neurovetenskap / cognitive neuroscience", "Biologiska Mekanismer av Mentala Processer / Biological mechanisms of mental processes" and "Miljöpsykellan: Interaktion Mental Processes och Miljö / Environmental Psychology: Human-Environment Interaction ". For its implementation, 37.5 ECTS credits are provided, which is almost 2.5 times more than in the curricula for training future psychologists at the previously analyzed Uppsala University (Table 6).

Table 6. A fragment of the curriculum for future psychologists at the University of Gothenburg

Code	Disciplines	Credits	Semester
Obligatoriska kurser / Compulsory basic courses			
PC2129	Kognitiv Neurovetenskap / Cognitive neuroscience	15	1; 2
PX1161	Biologiska Mekanismer av Mentala Processer / Biological mechanisms of mental processes	15	3; 4
PX1102	Miljöpsykologi: Interaktion Mellan Människa och Miljö / Environmental psychology: human-environment interaction	7,5	4

A thorough analysis of the science curricula reflected in the curriculum for future psychologists at the University of Gothenburg suggests that, although they differ in name from the disciplines at Uppsala University, they have much in common in terms of content.

The program of the discipline "Kognitiv Neurovetenskap / Cognitive Neuroscience", contained in the curriculum of the University of Gothenburg, in purpose, content and expected learning outcomes is completely similar to the discipline "Biologisk Psykologi / Biological Psychology" in the curriculum of Uppsala University.

The discipline "Biologiska Mekanismer av Mentala Processer / Biological mechanisms of mental processes" studied by students-psychologists of the University of Gothenburg, as well as the discipline "Hjärna och Beteende / Brain and behavior" from the curriculum of

Uppsala University involves the study of physiological mechanisms of attention. , learning, consciousness, emotions, speech and sleep.

However, despite the significant similarity in the content of science disciplines at the Universities of Gothenburg and Uppsala, we found that the discipline "Miljöpsykologi: Interaktion Mellan Människa och Miljö / Environmental Psychology: Human-Environmental Interaction" is not studied by future psychologists, and is only in the list of compulsory disciplines of the University of Gothenburg.

According to Lomberg (2019), the author of the curriculum for the discipline "Miljöpsykologi: Interaktion Mellan Människa och Miljö / Environmental Psychology: Human-Environment Interaction environment "the subject of her training is the analysis of the nature of environmental problems from a psychological point of view. This course, as the scientist notes, on the one hand, forms in future psychologists knowledge about the influence of environmental factors on the mental state of a person, and on the other hand, it illuminates the features of the influence of human activity on the state of the environment.

Stockholms universitet (2019) / Stockholm University is one of the largest educational and research centers in Europe and, according to the Academic Ranking of World Universities, is one of the fifty best universities in Europe and hundreds of the best universities in the world (Spencer, & Spencer, 2008).

Given the above, we consider it appropriate in our study to analyze the state of implementation of natural science training of future psychologists at Stockholm University.

A fragment of the curriculum for future psychologists at this University is shown in Table 7.

Table 7. A fragment of the curriculum for future psychologists at Stockholms universitet / Stockholm University

Code	Disciplines	Credits	Course
Obligatoriska kurser / Compulsory basic courses			
PB1001	Grunderna för biologi / Fundamentals of biology	5	1
PSPR08	Neurovetenskap kognition och lärande / Neuroscience of cognition and learning	20	1; 2; 3

Thus, the analysis of the curriculum for the training of future psychologists at Stockholm University showed that science training is 25 ECTS credits or 8% of the total (300 credits) and is represented by two disciplines: "Grunderna för biologi /

Fundamentals of Biology" and "Neurovetenskap kognition" och lärande / Neuroscience of cognition and learning "(Table 7).

The authors of the curriculum for the discipline "Grunderna för Biologi / Fundamentals of Biology" claim that the purpose of this course, on the one hand, is to form future psychologists' knowledge of biology: anatomy, physiology, genetics and ecology, and on the other - to motivate them to study the basics of biology as a theoretical basis for specialized disciplines in professional training.

The structure of the course "Neurovetenskap Kognition och Lärande / Neuroscience of cognition and learning" differs from all other previously analyzed courses. This discipline is studied during three years of study, ie almost the entire period of training of future psychologists at the bachelor's level. For its study, 20 ECTS credits were allocated, which are evenly distributed among the structural units (modules) of the discipline.

A detailed analysis of the working curriculum for the discipline "Neurovetenskap Kognition och Lärande / Neuroscience of Cognition and Learning", which is available on the official website of Stockholm University, showed that the first module of this discipline is introductory. It summarizes and details the knowledge about the structural and functional organization of the human nervous system, which students received during the course "Grunderna för Biologi / Fundamentals of Biology". Psychology students start studying the discipline "Neurovetenskap Kognition och Lärande / Neuroscience of Cognition and Learning" in the second semester of the first year of study, immediately after completing the course "Grunderna för Biologi / Fundamentals of Biology". In the process of studying the following modules of the course "Neurovetenskap Kognition och Lärande / Neuroscience of Cognition and Learning" psychology students develop competencies in: search and generalization of research literature on neuroscience, understanding the nature of mental processes and their correction taking into account biological factors.

Discussion

Thus, the analysis of the Swedish higher education system showed that the country's higher education institutions provide educational services in accordance with European standards that meet the level of "Bachelor's / Bachelor's", "Master's / Master's" and "PhD / Doctor of Philosophy (PhD)". However, for some areas of training for future professionals, including future psychologists, there is a continuous specialized five-year education.

A positive trend is the fact of increasing participation of students in the choice of disciplines of the natural science cycle with a clear neuroscientific bias (with one - several mandatory integrative courses (such as "Kognitiivisen neuropsykologian / Cognitive neuropsychology) from the approved list of disciplines and in other higher education institutions of the country and the world. This corresponds to two key trends in the development of higher education in Europe: first, the change in the role of the teacher from universal to consultative and organizational, and the student to a self-managed motivated personality (Zlatea, & Cucui, 2015). Secondly, by abandoning the stereotype of "getting an education" and affirming the principle of combining educational experience with one's own, with the need to learn independently and throughout life, to build personal professional tools in a flexible educational environment (Castañeda, Dabbagh, & Torres-Kompen, 2017).

Unfortunately, it has been noticed that there is still an ethical, categorical and deontological barrier in the interaction of psychology and neuroscience. This is due to the established tradition of distinguishing these disciplines, the difficulty of conducting neurophysiological diagnostics in psychotherapeutic practice, and the fact that neurophysiology is not traditionally used in cases of neurological norm (Bush, 2015). Despite this, neurophysiological data are increasingly taken into account in the prevention of ethical conflicts in management, in the practice of judicial, educational, sports and management activities, and therefore are widely implemented in the educational process at the faculties of psychology.

The study confirmed that the application of neuroscience in education in general is an interdisciplinary study of the relationship of external educational and psychological influences on the neural mechanisms of cognitive activity. Previously, educational theories contained a priori arguments about the validity of neuroscientific data for didactics and used only psychology "in its pure form." This distinguished both teachers and psychologists from the natural, especially reflexive basis of cognitive (didactics) and behavioral (education) processes. Currently, neuroscience and the humanities interact to maintain the brain in optimal adequate health in all types of influences and interactions (Thomas, Ansari, & Knowland, 2019). In the long run, such interactions should influence educational policy, the management of educational processes, and the day-to-day teaching practices of schools, colleges, and universities.

The analysis of compulsory and variable components of higher psychological education programs in Finland and Sweden confirms the fact that, despite the many modalities, psychology needs to update the basic

theories. The inclusion of neuroscientific advances in psychological and psychotherapeutic practice can accelerate therapeutic work, as it will correct not only the exogenous causes of cognitive impairment, but also their neurophysiological component. In addition, knowledge of the mechanisms of the brain will affect the psychological and educational practice, as well as the organization of therapeutic, corrective or educational environment (Alloway, & Alloway, 2014).

Natural science training for future psychologists in higher education institutions in Sweden and Finland is mandatory. It is also interesting to note that the curricula for the training of students of psychology contain a minimum of mandatory subjects for study, including science. Elective subjects, they can independently choose from the disciplines available in the institution of higher education list of additional courses or ask the curators to develop new courses in the area in which they need to gain in-depth knowledge.

Thus, analyzing the uniqueness of natural science training of future psychologists in higher education institutions in Finland and Sweden, we observe similarities in its implementation in higher education institutions in the countries analyzed above.

Thus, in higher education institutions in Finland and Sweden, as well as in the United States and Canada, students of psychology have the opportunity to choose elective science disciplines both at home and abroad, or even in other higher education institutions. The curricula for future psychologists in higher education institutions in Finland and Sweden include integrative science courses, and training is based on a competency-based approach in Spain, Italy, Poland, Hungary and the Czech Republic. Natural science training of future psychologists in Finland and Sweden, as well as in all the above-mentioned higher education institutions, is compulsory and has a professional orientation and involves the formation of relevant competencies.

Schwartz, Lilienfeld, Meca, & Sauvigné (2016) warn against extremes, which are often followed by psychologists. These extremes are that some psychologists believe that higher mental activity is almost unrelated to nervous function. The other part believes the opposite: the achievements of neuroscience will gradually displace psychology from therapeutic practice (eliminative reductionism). In fact, it is necessary to find a balance between the growing popularity of psychology and the rapid development of neuroscientific research (Schwartz, Lilienfeld, Meca, & Sauvigné, 2016). Scientists see the solution to the problem in the field of psychological education and practice, in particular in the appropriate

combination of social and natural components in the content of education and self-improvement of specialists, which is observed in the educational environment of the studied educational institutions.

Conclusions

So, a detailed analysis of the curriculum for the training of future psychologists at the universities of Sweden and Finland gives us grounds to assert that the study of the disciplines of natural science training of incentives in order to help future psychologists deeply understand the neurophysiological processes in neuroanatomical structures and sensory systems; promote the development of skills to apply instrumental methods to study the physiological functions of the human brain and analyze the results; teach them to draw conclusions and make correct, scientifically grounded professional decisions, as well as be aware of the influence of environmental factors on the mental health of an individual.

The content of the natural science component of education in the studied educational institutions involves the formation of neurophysiological and environmental competencies on the development of the human nervous system, nervous system plasticity, physiological mechanisms of mental processes and human interaction with the environment, including the impact of environmental factors on the mental state; understanding of the mechanisms underlying the dysfunctions of the autonomic and central nervous system, including diseases of the autonomic nervous system and brain disorders, as well as strategies for their correction; awareness of the feasibility of using in psychological practice of physiological research methods and methods of biological statistics; readiness to plan, implement and apply physiological techniques in future professional activities and interpret their results.

It is established that in higher education institutions of Finland, natural science training of future psychologists is carried out in accordance with the approved curriculum, which substantiates the feasibility of studying each compulsory discipline and training courses of students' choice.

In addition to the selected natural science disciplines proposed in the curriculum, students in higher education institutions in Finland have the right to independently choose for study the natural sciences that belong to the curricula of other faculties both within their own educational institution and in other institutions of higher education in the world.

The curricula for the training of future psychologists in Swedish higher education institutions list only the natural sciences that are compulsory for study. Elective courses are chosen by psychology students in

Swedish higher education institutions independently from the list of additional courses available in higher education institutions, or if there is no required discipline in the curriculum, they have the right to apply to the curator or head of the department. requesting the development of new training courses in the area in which they require in-depth knowledge. It is emphasized that students together with the responsible teacher make a proposal for the program of a new course.

In addition, an important role in the formation of neurophysiological, environmental and other natural science competencies is given to the personal experience of the student. As part of a personal educational trajectory, the student not only has the opportunity to choose in-university and out-of-university courses, but also to gain experience in laboratories, industrial practices in the performance of individual research tasks.

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