

Preparation of Future Specialists in Physical Culture and Sports for the Use of Digital Health Technologies in Professional Activity

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Abstract - The development of information technology has led to the emergence of specialized software in various fields of knowledge, including health and sports. Knowledge about them and the ability to use them become leading in the work of athletes and their coaches, so their mastery should take place within their professional training. The article describes a special course "Digital Health Technologies", which is studied by future specialists in physical culture and sports: content, forms, methods, and teaching aids. The authors present the results of statistical analysis and confirm the effectiveness of the special course: students confirm the ability to use specialized software to develop health programs and rehabilitation programs for athletes. Analysis of alumni surveys confirmed the effectiveness of the course.

Keywords - *digital technologies; digital health; specialists in physical culture and sports; professional training.*

I. INTRODUCTION

The phenomenon of digital health arose as a result of the digital revolution convergence with the health fields, health care and society. This phenomenon provides the rights and possibilities expansion of the members of society for better tracking, managing and improving their and their families' health. Digital technologies in healthcare sphere also improve access to information resources, reduce costs, improve the quality of health care and make it more personalized and accurate. Today, there is no clear definition of the "digital health" phenomenon, although the common point in the approaches of different authors is the establishment of the origin of this definition. Thus, one of the most recent definitions made in 2015 belongs to Phil Baumann, who interprets it as "the collaborative integration of different technologies with the health care system for disease prevention, diagnostics, treatment and control, as well as planned measures to promote, measure and maintain healthy well-being" [1].

A. Why do digital health technologies important for physical education and sports professionals?

The analysis of the requirements for the results of professional training of Physical Culture and Sports (PCS) specialists shows the importance of acquirement theoretical knowledge, based on the latest achievements of

various sciences. I.e. for professional training and further professional realization of PCS specialists, important information content is: first for the organization and successful implementation of the educational process, and then for supporting their activities and professional development of the specialist [2; 3].

Nowadays the information support is impossible without the use of digital technologies (DT) and the tools that make it possible to search for information over the Internet. It is crucial to analyze the empirical data on the tracking of physical characteristics of sportsmen, use of specialized software to support the educational process through the visualization of separate sport movements (or physiological changes in the human body), organize the professional interaction in chats or social networks, etc.

This highlights the necessity to develop the ability to use digital technologies, including digital health technologies for rapid analysis of professional information, critical evaluation of it and use in professional activities.

II. DIGITAL HEALTH TECHNOLOGIES

A. Key elements of digital health

The key elements of digital health as a result of the integration of DT with health care have been identified by Dr. Eric Topol. According to E. Topol, they include: wireless devices, sensors, hardware and software, microprocessor and integrated circuits, the Internet, social networks, mobile networks, health information technology, genomics and personal genetic information. Digital health includes such categories, as: mobile health (mHealth), wireless health, health 2.0, electronic health (e-Health), electronic patients (e-Patients), healthcare IT, health and healthcare data, cloud computing, telemedicine, personalized medicine, and other health-related notions [1; 4].

Depending on the platform underlying the use of web technologies for healthcare, there are Health 2.0, Health 3.0, Health 4.0. It should be noted that Health 2.0 is often defined as a movement that unites all health care providers who use Web 2.0 technologies to improve the quality of this process.

The term “Health 2.0” (Health 2.0), introduced in 2004, reflects the integration of health technologies with the Web 2.0 platform and means the use of social software to promote cooperation between patients, rehabilitation therapists, consulting physician, instructors, teachers and other health and physical education and sports workers. The platform includes: personalized search for health information to enrich the consumer experience; dissemination of knowledge between communities, technologies for content delivery and sharing, etc.

In 2011, Indu Subaiya and Matthew Holt clarified the concept of Health 2.0 as a healthcare field involving cloud technology and mobile devices, as well as other tools and applications with an accessible interface which in an interactive form provides data on a certain physical characteristic of a person. These technologies are implemented on the principles of customer-centric design, search for information to help the consumer simplify the decision-making process.

In analyzing the experience of using web technologies in the context of health issues, our attention was caught by the British site Cosmic Kids (<http://www.cosmickids.com>), which presents videos with sets of yoga exercises (Cosmic Yoga) on YouTube. These exercise videos are widely used all over the world for yoga classes both in schools and at home. Every month, the site’s developers upload a new set of exercises to YouTube. Access to the exercise complexes on YouTube is free. Interesting titles of gymnastic complexes, relevant video design and good mood of the coach make yoga classes useful and exciting.

An analysis of Internet sources showed that today there are a huge number of applications for counting calories and physical activity, such as: “Your fitness assistant”, “Your diet assistant”, “Excellent calories counter”, as well as MyFitnessPal, FatSecret, Diet & Diary, for Endomondo fitness, Nike Training Club, In Shape Free, Runkeeper, Samsung Gear Fit (fitness bracelet). Such supplements have advantages: they can always be with the user, thus saving time (for example, keeping a calorie diary), stimulating to keep fit, etc.

Therefore, according to the results of the analysis of digital health technologies, a conclusion should be made about the expediency of their use in the professional activities of PCS specialists.

B. Physical Culture and Sports (PCS) professionals need to be prepared to use the means of physical education that are associated today with digital health technologies.

It was important at the stage of ascertaining the problem to identify the state of use of digital health technologies in the process of professional activity of PCS specialists and to identify difficulties that arise in their use.

For this purpose, a survey was conducted among the specialists of PCS (Ukraine). In the process of preparing the questionnaires we used both basic (direct and indirect, clarifying and complementary) and control questions, taking into account that during the answer there may be

corrections caused by subjective factors. Before the questionnaire, the purpose and rules of filling in the questionnaire were clarified, each respondent had own form of the printed questionnaire. It should be noted that one of the conditions of the survey was the possibility of anonymity, as it allowed the reviewers to be as frank as possible.

The results of the survey showed that the majority of respondents (86%) have difficulties in the period of adaptation in the professional space during the professional development, which are related to various reasons. The greatest difficulty among the respondents were a psychological problems (53%), because of reflection the inner feelings of the graduate in the period of adaptation to professional activity. Thus, 38% of respondents indicated uncertainty about their own professional competence in the face of rapidly growing technological progress, and only 15% attribute these difficulties to other reasons (emotional stress due to difficulties at work, difficulties in communicating with other colleagues, rejection in the team, difficulties in communicating with the staff). The fact that a significant proportion of respondents (36%) had a lack of knowledge, skills, and abilities to use digital health technologies to support their professional activities was of particular note in the survey.

The following answers were received to the question “How often do you use digital health technologies in your work?”: constantly (daily) – 8%; often (several times a week) – 32%; occasionally (several times a month) – 42%; occasionally (several times a year) – 18%; do not use – 0%.

The majority of respondents (70%) agree with the statement that the use of these technologies has a positive effect on the quality and level of knowledge acquisition, 13% have doubts about their effectiveness for the professional activities of FTS, 17% did not decide on the answer.

The majority of respondents (92%) noted that they would like to increase the level of knowledge, skills, abilities in the use of digital health technologies in the professional activity of a PCS specialist.

The obtained data allowed to formulate the following conclusions: the vast majority of PCS specialists have a superficial idea of digital health technologies and the peculiarities of their use to support professional activities; the vast majority of PCS specialists do not implement them in practice due to lack of knowledge, skills, abilities to work with information resources.

The results of the questionnaire gave grounds to claim that for young professionals who are well versed in the means of the digital technologies (DT) adaptation in the professional space is much easier. Thus, a significant amount of the necessary literature can be found on the Internet, visual and demonstration materials can be found on social networks or channels or made by the professional, and the exchange of experiences can be systematically carried out in special forums or online conferences.

The study found that, unfortunately, a significant number of respondents have mostly superficial, unsystematic knowledge on the implementation of digital health technologies in the professional activities of PCS, fragmentary ideas about their ability to optimize professional activities.

Based on the analysis of the answers to the questionnaire, it was found that today a significant number of PCS specialists are already trying to use DT tools.

We believe that PCS specialists should be prepared to use the means of physical education, which are associated today with digital health technologies: pedometers, electronic bracelets, where it is possible to measure physical activity (number of kilometers travelled, number of ascents by floors, etc.) and physical body parameters (pulse, pressure, weight, etc.). Their involvement on the one hand is interesting for young people, and on the other hand is related to the specifics of the professional activities of future specialists PCS, which is now integrated with DT [5; 6; 7; 8].

C. Study of the special course “Digital Health Technologies”

The special course “Digital Health Technologies” was introduced into the educational program for training specialists in the specialty “Physical Culture and Sports”. The special course included a computer lab workshop (studying software for smartphone applications, applications for portable devices such as iPhone and iPad) and the use of educational resources (created using the Moodle platform).

The purpose of studying the special course “Digital Health Technologies” is the formation of information and digital culture of the future PCS specialist through the formation of meaningful and responsible attitude to the health, knowledge about health and a healthy lifestyle, digital technologies of support and control over health, ability to use digital health technologies in professional activities and reflection skills in relation to their application.

The main tasks of studying the special course are: mastering the basics of a healthy lifestyle; formation of ideas about information methods and digital means that preserve and strengthen health; formation of understanding of the essence of culture, culture of health and healthy lifestyle; formation of motivation to maintain health as the highest value by means of DT; education of the need for real health practice with the involvement of DT, their active creative use to achieve life and professional goals; formation of skills to independently develop technologies for the application of DT of individual rehabilitation, aimed at prevention, correction of personal health, support and development of body resources.

The content of the developed resource includes educational and methodical information that will allow the student to master the practical skills to use digital health technologies for analysis and didactics of motor actions in physical education and sports training.

The laboratory workshop contains a theoretical block (includes educational information), a practical block (the use of social networks for educational purposes, use of web technologies of health-preserving subjects, performance of settlement and graphic works directed on definition of weight of the person, measuring the characteristics of physical activity, calorie counting and physical activity, i.e. the use of so-called “mobile nutritionists and trainers”, etc.), help block (dictionary of basic terms through blogs, wiki, social networks, podcasts, chats, video sharing) and control block (special testing program) (Fig. 1).

The window displays a form for student health monitoring. It includes sections for personal information (name, date of birth, etc.), physical activity (steps, distance, etc.), and health metrics (heart rate, blood pressure, etc.). There are also checkboxes for various health conditions and a section for additional comments.

Figure 1. Window of the special course “Digital Health Technologies” for calculation and graphic works

The window displays a table with 22 rows of questions and their corresponding answers. The questions are related to health, physical activity, and lifestyle. The answers are provided in a column on the right.

Вопрос	Ответы
1. Дайте общую оценку своему здоровью	Удовлетворен
2. Как изменился Ваш самочувствие за последний год?	Не ухудшилось
3. Считаете ли Вы, что регулярные физические упражнения укрепляют здоровье и повышают работоспособность?	Да
4. Испытывает ли Ваш организм потребность в дополнительной физической активности?	Иногда
5. Испытывает ли Вы быструю утомляемость при физических нагрузках?	Нет
6. В состоянии ли Вы проводить интенсивные нагрузки, или Вы предпочитаете умеренные, но продолжительные?	Да
7. Есть ли у Вас/у Ваших родителей заболевания с ОН из-за наследственных или хронических заболеваний?	Нет
8. Беспокоит ли Вас неприятная онемение, боли в области сердца в покое?	Нет
9. Беспокоит ли Вас боли в области сердца при выполнении физических упражнений?	Иногда
10. Бывает ли у Вас одышка или головокружение?	Нет
11. Беспокоит ли Вас головные боли в покое или при физических нагрузках?	Нет
12. Ухудшилось ли у Вас зрение за последний год?	Нет
13. Беспокоит ли Вас боли в суставах?	Нет
14. Бывает ли у Вас онемение на ногах?	Нет
15. Оцените уровень своего подготовленности при интенсивной физической нагрузке	Умеренный
16. Как часто испытываете Вы чувство жажды?	Иногда
17. Делаете ли Вы зарядку?	Да
18. Оцените качество своего режима питания	Полноценное
19. Каково у Вас психоэмоциональное состояние дома, в семье?	Нормальное
20. Курите ли Вы?	Нет
21. Пьете ли Вы спиртные напитки, в том числе пиво?	Иногда
22. Как Вы оцениваете уровень текущих физических нагрузок на занятиях по физическому воспитанию?	Низкий

Figure 2. The window of the special course “Digital Health Technologies” – a reference block

When selecting the exercises, we took into account that they should be multifunctional, and meet the following requirements: clarity; professional orientation of tasks; creative approach; the presence of instructions for action with the material; novelty.

The purpose of such exercises was to expand students’ understanding of the possibilities of using the Internet, deepen theoretical knowledge of the profession, improve skills of search, processing and analysis of professional information, use of digital technologies to solve professional problems, develop logical and critical thinking. This approach simulates the content of future professional activity, reproduces the conditions and actions in which information and digital technologies are used.

After a series of exercises, reflection, discussion and analysis were mandatory: What important things did you learn? Was it useful for you? What do you think about this exercise? How can you use this in your professional activities? The students had to continue the phrase: “I think, ...”. Such activities contributed to the formation of participants’ self-analysis skills. The teacher was given the opportunity to correlate subjective judgments and assessments with “objective” impressions and abilities of members of the student group, to prepare the next lesson, to select participants exercises. The study of these programs contributed to the formation of students’ ability to use specialized software, including digital health technologies in order to solve professional problems.

D. The results of the pedagogical experiment

To calculate the quantitative characteristics of the impact of studying the special course, testing was used which included questions on the use of digital health technologies.

Experimental work involved 610 students during 2015-2020. The first experimental group (EG1, 213 students) majoring in 017 Physical Culture and Sports attended classes in-person and in part within distance learning. The second experimental group (EG2, 202 students) majoring in 017 Physical Culture and Sports studied remotely through the Moodle platform.

The first and second groups, in addition to the general “Digital Technologies in the field of PCS” course, had to master a special course “Digital Health Technologies”.

Students of the control group (CG, 195 students) studied with the involvement of traditional full-time methods, forms and means of teaching. At the same time, they did not study the special course.

The distribution of levels of academic achievement at the beginning and end of the experiment is presented in the diagrams (Fig. 4-5).

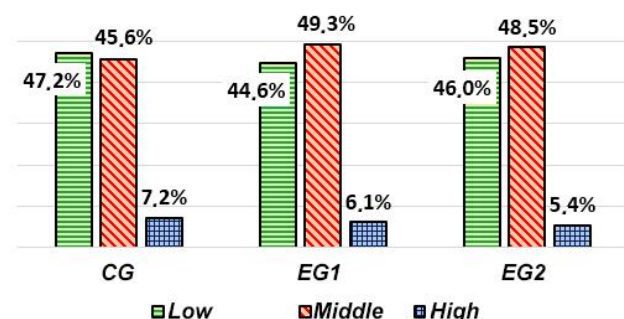


Figure 3. Distribution of levels at the beginning of the experiment

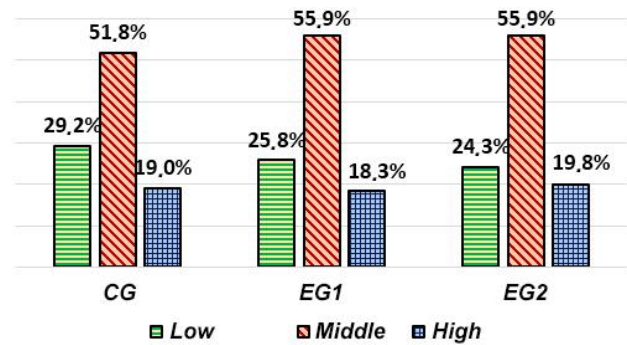


Figure 4. Distribution of levels at the end of the experiment

Empirical values of statistics according to Student’s criterion for the indicator “ability to use DT” are calculated in MS Excel and are presented in table 1.

TABLE I. EMPIRICAL VALUES OF STATISTICS BY STUDENT’S CRITERION (TCRIT. = 1.97)

Groups	EG1	EG2	CG	At the beginning of the experiment
EG1		0.36	0.18	
EG2	-2.04		-0.17	
CG	2.38	3.56		
At the end of the experiment				
Average (before experiment)	40.09	39.48	39.77	
Average (after)	54.11	60.49	49.13	
Dynamics of averages	35%	53%	24%	

The calculation data in the table give grounds to assert that at the level of significance of 0.05 the values of the averages for EG1, EG2 and CG at the beginning of the experiment do not differ statistically.

Analysis of the initial and final results of the pedagogical experiment confirms the positive dynamics of levels in all groups. At the same time, statistical examination of the shift of the averages for the groups EG1, EG2 and CG by Student’s test revealed their statistical discrepancy for each possible pair. The averages for all samples were statistically different: the highest value in EG2 (60.49), then EG1 (54.11), the lowest in CG (39.77).

We explain the obtained dynamics not only by the introduction of a special course, but also by the use of distance learning technologies, which contributed to the development of skills of information exchange, search, comparison and prediction of professional actions based on digital health technologies.

III. CONCLUSION

The active development of digital technologies and tools determines the reorientation of professional activities of specialists, including PCS specialists, to the virtual space, where the ability to analyze information flows, the ability to use specialized software and to provide effective communication online and offline is in demand.

Digital health technologies not only allow interactive tracking of changes in the physical state of the body, but also allow to be perceived as a powerful tool for professional activity of PCS specialists. In the process of training by visualizing schedules of changes in physical condition, they can become a tool for developing effective methods of rehabilitation, training, and rehabilitation.

The use of digital health technologies enables PCS specialists to teach movements using the basic principles of health care, improve motor programs, promote health and create safety conditions in the process of physical culture, sports and coaching work, and physical rehabilitation of patients and athletes.

The developed special course confirmed its effectiveness for full-time and distance learning formats, and the results of educational achievements were the best when learning online.

We see the problems of mastering digital health technologies on open educational platforms by future specialists of PCS as prospective for further research.

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