Journal of Physical Education and Sport ® (JPES), Vol. 21 (issue 6), Art 477, pp. 3527 - 3533, December 2021
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Media project to improve digital competencies of sports coaches

NATAL'YA MISCHENKO[1], MIKHAIL KOLOKOLTSEV[2], ANTON VOROZHEIKIN[3], ELENA ROMANOVA[4], ANDREI TARASOV[5], SERGEY AGANOV[6], SVETLANA KARPOVA[7]
[1]Department of Theory and Methods of Physical Education, Ural State University of Physical Culture, Chelyabinsk, RUSSIA
[2]Department of Physical Culture, Irkutsk National Research Technical University, RUSSIA
[3]Department of Information Technologies, Kaliningrad Institute of Management, RUSSIA
[4]Department of Physical Education, Altai State University, Barnaul, RUSSIA
[5]Department of Pediatrics and Preventive Medicine, Immanuel Kant Baltic Federal University, RUSSIA
[6]Department of Physical Training, GPS Emercom of Russia St. Petersburg University, RUSSIA
[7]Department of Physical Culture and Sports, Saint-Petersburg State University of Aerospace Instrumentation, RUSSIA

Published online: December 30, 2021
(Accepted for publication December 15, 2021)
DOI:10.7752/jpes.2021.06477

Abstract:
Educational information and communication technologies (ICT) use in a teacher's activity is a prerequisite for his\her successful and effective work. Currently, in connection with the COVID-19 pandemic and the transition of specialists to a remote form of professional activity, increasing sports coaches' digital competence has turned out to be especially relevant. **Research aim**: approbation of a media project to increase the sports coaches' digital competence level. **Material & methods**. The participants of the media project were 24 sports coaches from Chebarkul, Russia, who underwent ICT training in a remote format. The high-stakes testing of the coaches' ICT skills and abilities was carried out, the sports coaches' cognitive, integrative-activity and personal-motivational components of the digital professional competence assessment was given. **Results.** The results of the entrance test (questionnaire) showed a low level of digital competence among sports coaches. More than 40% of coaches do not use ICT in training sessions and sports competitions, 50% of the coaches surveyed do not use the digital support technology for monitoring athletes' physical condition and health. At the end of the research media project, all coaches significantly increased their computer program proficiency by 1.75 times, their Internet skills increased by 3.4 times. The values of the cognitive component indicators of ICT competence increased by 2.7 times, the integrative-activity component by 1.88 times. The number of coaches motivated to improve their digital competence has increased by 2 times, $p < 0.05$. **Conclusions**. The approbation of our media project has shown high efficiency. Digital technologies are relevant and necessary, and sometimes the only means of continuing a person's professional activity under the conditions of the COVID-19 pandemic and switching to a remote form of work.
Key Words: **Information and communication technologies (ICT), coach, sports, digital competence**

Introduction

The time has come when digital technologies began touching all spheres of human activity. Educational information and communication technologies (ICT) are used in physical culture and sports practice. The use of electronic means and methods in the pedagogical activity of a sports coach significantly increases the efficiency and motor density of a training session, helps an athlete control his physical and functional parameters, technical characteristics, and prevents injuries (Hirsh, 2018; Seshadri et al., 2017), influence his athletic achievements (Koryahin et al., 2019a). ICT are widely used in the process of teaching «Physical Culture» discipline in educational institutions (Eun Hye Kwon, 2020; Hrehorowicz, 2021) and monitoring the level of students' knowledge and skills (Acar, & Eler, 2019; Shutova et al., 2021), which is especially important for modern distance learning during the COVID-19 pandemic (Kuzbik, & Wronka, 2021). The basis for modern specialists' in the field of physical culture and sports training system modernization is digital informatization as a new tool in the technology of pedagogical activity (Di Tore, 2016; Loia & Orciuoli, 2019).

Therefore, one of the important indicators of a sports teacher's professional readiness for effective management of the educational process is his digital competence (Ferry, & Romar, 2020). In the modern world, digital competence is the basis for the professional activity success of any specialist in the field of education and training of the population. In the pedagogical community, digital literacy can significantly raise the process of education and upbringing to a higher level (Stefaniak et al., 2016). Modern information and communication technologies allow sports teachers and coaches to quickly rebuild the forms and methods of training athletes and referees in an operational mode (Mishchenko, & Svetikov, 2020). The results of scientists' observations indicate

Corresponding Author: ELENA ROMANOVA, E-mail: romanovaev.2007@mail.ru

an increase in human cognitive abilities when mastering ICT, especially when observing physical activity (Multisport Index, 2020).

Olkhovskaya (2020) reports that «introduction of digital technologies into educational process puts forward new requirements for the teaching culture of the teacher and coach, to the forms and methods of teaching». The integration of ICT into the educational process makes it possible to increase its effectiveness (Di Tore, 2016). The need for digital modernization of physical education and sports is reported by Koryagin et al. (2019b). Despite the widespread use of digital technologies in physical culture and sports activities in Russia, a significant number of PE teachers and coaches have a low level of digital literacy and do not use this technology in their teaching practice (Andryushchenko et al., 2019; Ataeva, 2020; Shutova et al., 2021). A similar situation is found in other countries (Kubik, & Wronka, 2021).

The Russian scientific literature does not fully provide data on sports teachers' knowledge level in the field of ICT. We believe that solving coaches' digital readiness problems is of particular importance for modern education, training and sports training in Russia development, especially during the period of mass restrictive measures caused by respiratory viral infections.

Research aim: approbation of a media project to increase the sports coaches' digital competence level.

Material & methods

24 coaches of the sports and recreation institution «Physical Culture and Sport» in Chebarkul, Russia participated in the implementation of the research media project. The average age was 39.3 years, average work experience - 14.4 years. At the beginning of the project, we got acquainted with scientific literature and developed a questionnaire for boundary testing and evaluation of the coaches' digital skills and abilities using the Porokhovskaya survey methodology (2015). Then we created a roadmap for the implementation of the project to increase the coaches' digital competence and formed a package of educational and methodological materials (Table 1). We conducted an experiment, analyzed the data obtained and drew conclusions. The training took place remotely online (September 2019 - May 2020).

Table 1. The media project roadmap

Month	Kind of work	Theme	Aim
September	Practice	Questionnaire	Determine the coaches' initial level of ICT competence
	Lecture	ICT in sport	Coaches' ICT competence formation
October	Seminar	Data protection	Introducing coaches to digital hygiene and safety
	Consultation	ICT in training process	Give recommendations to teachers about the use of ICT in the training process
November	Practice	Computer networks use in a coach's professional activity	To teach coaches the methods of digital document management using a local computer network
	Seminar-workshop	Internet Educational Resources	To study the methods and ways of telecommunications and distance education technologies
	Consultation	Global Internet network	To familiarize the coaches with the basic principles of the global Internet organization
December	Practice	Internet resources in the field of physical culture and sports	To form the coaches' knowledge, competencies and skills of digital communication
	Webinar	Interactive equipment and the «digital world»	To familiarize the coaches with the types of interactive equipment and their capabilities
February	Seminar-workshop	Pedagogical design	To teach the coaches skills of creating multimedia products
	Consultation	Computer programs to support the training process	To teach the coaches the use of computer programs in the training process
March	Seminar-workshop	Creating professional content for a teacher	To teach the rules of creating and maintaining a coach's personal content
April	Workshop	Organization and conduct of a training session with the use of ICT	Practical demonstration of a training session using ICT
May	Practice	Final survey	To determine the coaches' level of ICT competence after training

We investigated and conducted a milestone assessment (progress check) of cognitive (score), integrative-activity (score) and personal-motivational (%) components of the coaches' digital professional competence. The consent of the project participants had been received. The conducted research project complies with the international rules for conducting experimental scientific work. On the basis of licensed computer programs STATISTICA 10.0, MS Excel 2010, statistical processing of the obtained research materials was carried out. The Mann-Whitney U-test was used to compare two independent samples. The forecast level of 95% was considered sufficient ($p<0.05$).

Results

The analysis of the entrance test questionnaire results showed a low level of digital competence among the coaches. A total of 33.3% of sports coaches are interested in mastering ICT and using them in their professional activities, 75% of respondents use digital technologies only to prepare educational and methodological material for training sessions, 29.1% of coaches have training sessions accompanied by ICT. More than half of the surveyed project participants use ICT for self-education.

62.5% of coaches use the Internet to search for thematic materials, 20.8% of them use electronic manuals. All coaches do not create or use multimedia educational programs and applications, do not keep electronic diaries for monitoring the health status and results of their athletes' sports training. For organizational and methodological support and preparation of a training session, 45.8% of coaches use ICT 1-2 times a quarter and 16.6% do not use ICT at all in coaching.

All the coaches replied that information and communication technologies can significantly facilitate the preparation for classes and allow them to diversify. At the same time, it was revealed that 41.7% of coaches do not use ICT in training sessions and competitions, 50% of the interviewed coaches do not use the technology of digital support for monitoring the physical condition and health of athletes. It was revealed that 50.0% of the interviewed coaches lack digital skills to create modern teaching aids and recommendations. All respondents do not digitally process the results of the competitions.

The conducted survey results analysis at the beginning of the research showed that 50.0% of coaches indicated that the organization where they work partially created conditions for the use of ICT. 50.0% of coaches did not participate in the work of pedagogical Internet communities (communication, participation in forums, professional Internet contests, festivals, seminars, conferences, master classes on the pedagogical experience dissemination, etc.).

All coaches had no publications of methodological materials on pedagogical Internet sites. Based on the results of the survey, the problems that prevent coaches from using ICT in their professional activities had been identified. 100% of coaches indicated an insufficient level of knowledge and the absence (or lack) of educational software, 87.5% noted the lack of electronic methodological support, 70.8% of coaches reported an insufficient number of computers in a sports institution. 37.5% of respondents indicated problems with Internet access. To characterize cognitive abilities in the field of ICT, the coaches' computer program proficiency skills (Table 2) and Internet skills (Table 3) of digital competence were studied.

Table 2. The values of indicators of skills in computer programs (on a 10-point scale), M±m

Test №	Computer programs	At the beginning of the project (n=24)	At the end of the project (n=24)
1	Text editor (World, Writer and others)	6,3 ±1,10	9,5 ±1,52*
2	Media presentations preparation (PowerPoint, Impress and others)	5,4±1,22	8,7±1,31*
3	Information Search services (Google, Rambler, Yahoo, Yandex)	6,2±1,24	9,4±1,62*
4	Communication services (Skype, ICQ and others).	6,2±1,25	9,7±1,42*
5	Graphics (Potoshop, Gimp and others)	4,4±1,48	8,6±1,54*
6	Video service (Adobe Audition, Movie Maker, Pinacle, Studio, Vegas)	3,8±1,18	7,9±1,34*
7	Table editor (Exel, Calc and others)	3,7±1,12	7,8±1,44*
8	Educational process management («Chronograph», «Avers» («Obverse») and others)	2,4±1,22	6,2±1,39*
9	Distance learning (Google application, Moodle)	4,4±1,31	8,2±1,51*
10	Network services Web 2 (Mail, Google, Yahoo, Vkontakte and others)	5,9±1,33	9,2±1,64*
Total score		48,9±3,82	85,2±4,92*

Note * - the difference is significant (p <0,05)

At the end of the research project, all coaches had significantly increased values of computer program proficiency indicators (p <0.05). The overall score increased by 42.6% (from 48.9±3.82 at the beginning to 85.2±4.92 points at the end of the project), p <0.05. Figure 1 shows the increase in the values of computer program proficiency indicators at the end of our media project.

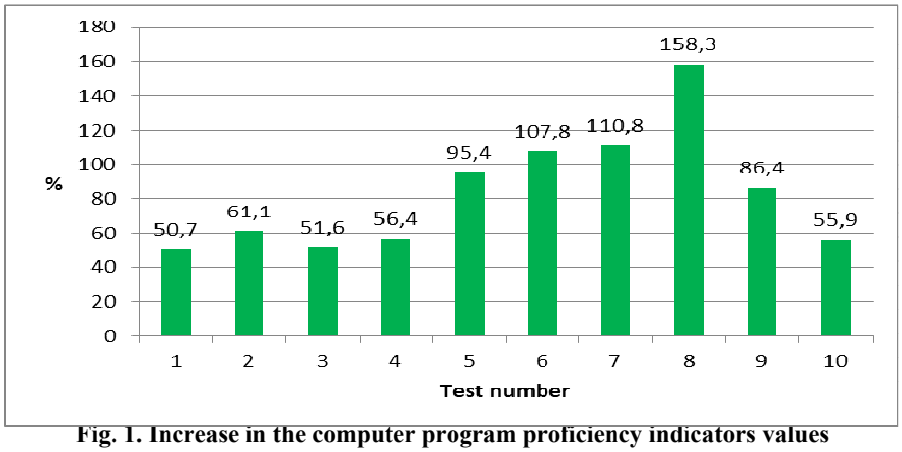

Fig. 1. Increase in the computer program proficiency indicators values after the experiment (%)

The analysis of the results presented in Table 2 and Figure 1 allows us to conclude that after participating in the research project, the coaches had the most increased values of indicators in tests # 6, 7, 8, 9, which characterize the basic digital professional skills necessary for a sports coach. At the end of the training, the coaches significantly increased the Internet skills indicators values (Table 3).

Table 3. Internet skills indicators values (on a 10-point scale), M±m

Test №	Skills	At the beginning of the project (n=24)	At the end of theproject (n=24)
1	For searching for sports and educational information	3,4± 1,39	9,8± 1,97*
2	For viewing new scientific and methodological materials	3,5± 1,49	9,6± 1,52*
3	For communication and participation in sports and pedagogical communities	1,5± 0,34	5,9± 1,42*
4	For distance learning	1,6± 0,39	9,2± 1,93*
5	For using Web 2.0 network services	3,9± 1,86	7,9± 1,12*
6	For participation in the educational process management, electronic control logsregistration	1,6± 0,27	5,8± 1,23*
7	For the digital teaching aids preparation	3,2± 1,43	6,9± 1,51*
8	For sending materials of personal pedagogical experience	1,0±0,24	6,8±1,48*
9	For athletes' remote communication and training	1,0±0,24	6,9±1,85*
10	For communication with athletes' parents	1,0±0,24	6,5±1,93*
Total score		21,7± 2,38	75,3±4,83*

Note * - the difference is significant (p <0,05)

After the project was tested, the value of the Internet skills indicator for coaches increased 3.4 times, compared with the value at the observation beginning (75.3± 4.83 points and 21.7± 2.38 points, respectively), p <0.05. Especially significantly, the scores of tests # 8, 9, 10 increased more than 6 times, (Table 3). After the completion of the project, the cognitive component of the coaches' ICT competence (computer program skills + Internet skills) increased 2.7 times compared to the beginning of the study. We evaluated the integrative-activity component of the coaches' digital competence based on the values of the indicators of four tests (Table 4).

Table 4. Values of the integrative activity component indicators (points, M±m)

Test №	Indicators	At the beginning of the project (n=24)	At the end of the project (n=24)
1	Methodical evaluation of a training session using ICT (max=25 points)	12,2±2,21	23,8± 2,32*
2	The effectiveness of using ICT in a training session (max=25 points)	13,2±2,97	22,7±2,29*
3	The effectiveness of using ICT in a training session (max=15 points)	6,0±1,28	14,0± 1,87*
4	Evaluation of the quality and effectiveness of electronic educational resources used in the training session (max=25 points)	12,9±2,23	22,8±2,83*
Total score		44,3±4,71	83,3±5,98*

Note * - the difference is significant (p <0,05)

The values of the integrative-activity component indicators of the coaches' digital competence at the end of the project significantly increased in all tests. The overall score increased by 88.0% (from 44.3±4.71 at the beginning to 83.3±5.98 points at the end of training), $p < 0.05$. The result of the effectiveness of our media project testing is a significant increase in the number of coaches, interested in improving the level of digital competence (Table 5).

Table 5. Motivational component of coaches' digital competence (number of people, %)

Question of the questionnaire		
Respondents' answers	At the beginning of the project (n=24)	At the end of the project (n=24)
«The presence of interest in the ICT mastering and their application in professional activities»		
Yes	41,7	83,3
No	25,0	0
Partially	33,3	16,7

At the end of the project, there was a 2-fold increase in the number of coaches interested in improving their digital competence, from 41.7 to 83.3%. There were no coaches who had no interest in ICT.
Our research media project has significantly increased the cognitive, integrative-activity and motivational components of the digital competence of sports coaches.

Dicussion

In the modern media space, much attention is paid to the issues of information literacy and the problems of teaching people digital skills, as reported by specialists of the United Nations Educational, Scientific and Cultural Organization and Carretero et al. (2017). Digital technologies are very important for sports pedagogy (Eun Hee Kwon, 2020; Hrehorowicz, 2021). Researchers have compiled a report on the need to use distance learning in educational institutions in the context of the COVID-19 pandemic (Ferry & Romar, 2020; Kuzbik, & Wronka, 2021). The introduction of wearable digital devices into a person's daily life is becoming more widespread, which make it possible to effectively and efficiently use the means and methods of physical education in any conditions (Hirsh, 2018) and make adjustments to training. Digital technologies are widely used in the training process (Karyakin et al., 2019a).

The use of digital technologies in the educational process can be realized only if there is a sufficiently high level of media literacy of the population, which is consistent with the opinion of experts at the G20 Summit and the data of the study by Chetty Krish et al. (2018). The results of the survey of our research project participants are consistent with the data of the scientific literature on the low level of teachers' knowledge and the insufficient use of modern ICT methods in the educational process (Bezkopylnyi et al., 2020). As noted by Andryushchenko et al. (2019) more than 60% of coaches in Russia do not know the methods of collecting, processing and storing professional information, 68% of teachers do not know the content characteristics of the digital educational environment and have difficulties working on the new format of education (Shutova et al., 2021).

The media project tested by us to improve sports coaches' digital competence skills has shown the high effectiveness of this method of training the coaching staff. This is consistent with the opinion of Nowak (2019), García-Soidán et al. (2020) on the important role of Internet resources in the coaches' professional activities. Compared with the beginning of the research project, at the end of the training, all sports coaches showed a significant increase in the level of proficiency in basic computer programs. The values of indicators characterizing the frequency of the digital technology use by coaches in their professional activities have increased by more than 3 times. According to Shutova et al. (2021), the use of ICT in the educational process of university students' physical education increased the effectiveness of the educational process and students' motivation to physical activity. In our research, the trend of increasing the motivational component of digital competence by almost 2 times has been established. These data confirm the information of Loya & Orciuoli (2019) that the presence of digital competence among coaches contributes to high achievements among their athletes. The main reasons for the initially low level of our project participants' digital competence are insufficient level of ICT knowledge, a limited number of programmatic and methodological materials in the workplace that are consistent with the research Porokhovskaya (2015). The results of our media project confirm the relevance of the chosen research topic in conjunction with modern requirements of the digital world to the competent performance of professional duties in any area of human activity.

Conclusions

The high-stakes testing results showed that before the experiment, sports coaches had insufficient knowledge, skills and abilities to use information and communication technologies. At the end of the research media project, the cognitive component of the sports coaches' digital competence significantly increased by 1.75 times, especially in the skills of using computer programs to control the training process and the skills of

conducting distance learning; the values of the integrative-activity component indicators of the coaches' digital competence significantly increased by 1.88 times; the number of coaches motivated to increase their digital competence increased by 2 times, $p < 0.05$.

The preparation and implementation of our media project began before the situation with COVID-19, so we believe that our work was timely and necessary. Digital technologies have proved to be relevant and necessary, and sometimes the only way to continue a person's professional activity in the conditions of the COVID-19 pandemic and the transition to a remote form of work.

The study of cognitive, integrative-activity and motivational components of coaches' and teachers' digital competence of sports activity are important evaluation criteria of their digital literacy and professional skills of a teacher. In the context of COVID-19 pandemic continuation and the availability of remote forms of work in the fields of economics, business, education, sports, the digital literacy of coaches, athletes and their high ICT skills are especially relevant.

Conflicts of interest. The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References:

Acar, H., & Eler, N. (2019). The Effect of Balance Exercises on Speed and Agility in Physical Education Lessons. *Universal Journal of Educational Research*, 7(1), 74-79. DOI:10.13189/ujer.2019.070110.

Andryushchenko, L.B., Shutova, T.N., & Vysotskaya, T.P. (2019). Development of an additional professional training program for trainers. *Scientific Notes of the University of P. F. Lesgaft***,** 7(173), 6-9. (in Russian)

Ataeva, E.A. (2020). Online services of the Internet network in distance learning of students of SPO. *Nauka: obshchestvo, ekonomika, pravo*, (2), 262-268 (in Russian)

Bezkopylnyi, O., Bazylchuk, O., Sushchenko, L., Bazylchuk, V., Dutchak, Y., & Ostapenko, H. (2020). Peculiarities of application of interactive educational technologies in training of future teachers of physical culture to work with health protection in secondary school. *Journal of Physical Education and Sport*, Vol 20 (Supplement issue 1), Art 40, pp 291 – 297. DOI:10.7752/jpes.2020.s1040

Carretero, S., Vuorikari, R., & Punie, Y. (2017). DigComp 2.1: The Digital Competence Framework for Citizens with eight proficiency levels and examples of use. With eight proficiency levels and examples of use. Luxemburg: Publications office of the European Union. Available from: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC106281/web-dig comp2.1pdf_(online).pdf

Chetty Krish, Liu Qigui, Nozibele Gcora, & Liu Qigui (2018). Bridging the digital divide: measuring digital literacy. *Economics E-Journal*, 12(1), 1-20. DOI:10.5018/economics-ejournal.ja.2018-23

Di Tore, P.A., Schiavo, R., & D'isanto, T. (2016). Physical education, motor control and motor learning: theoretical paradigms and teaching practices from kindergarten to high school. *Journal of Physical Education and Sport*, 16(4), 1293-1297. DOI: 10.7752/ jpes.2016.04205.

Eun Hye Kwon (2020). Review of online learning in physical education teacher education (PETE) program. *Journal of Physical Education and Sport*, Vol.20 (6), Art 480, pp. 3560 - 3568. DOI:10.7752/jpes.2020.06480

Ferry, M., Romar, J.E., (2020). Physical education preservice teachers' physical activity habits and perceptions of the profession and subject: development during teacher education. *Journal of Physical Education and Sport*, Vol 20 (Supplement issue 6), Art 422, pp. 3108 – 3119. DOI:10.7752/jpes.s6422

García-Soidán, J. L., Leirós-Rodríguez, R., Romo-Pérez, V., & García-Liñeira, J. (2020) Accelerometric Assessment of Postural Balance in Children: A Systematic Review. *Diagnostics (Basel),* 11(1), 8. DOI: 10.3390/diagnostics11010008.PMID: 33375206.

Hirsh, A. (2018). Technology on the run: promoting active behavior in diverse. Supported physical education classes – ICT. Available from: https://www.researchgate.net/publication/339428010

Hrehorowicz, A. (2021). Sports in college – opinions of generation Z about physical education during the COVID-19 pandemic. *Journal of Physical Education and Sport*, Vol 21 (Suppl. issue 2), Art 137, pp. 1091-1097, DOI:10.7752/jpes.2021.s2137

Koryahin, V., Iedynak, G., Blavt,O., Galamandjuk, L., Ludovyk, T., Stadnyk, V., Bezgrebelnaya, E., & Afonin, V. (2019 a). Hardware operational control of spatial and temporal parameters of the athlete's movement. *Journal of Physical Education and Sport*, 19(4), 367, 2424-2428. DOI:10.7752/jpes.2019.04367.

Koryahin, V., Blavt, O., & Ponomaryov, S. (2019 b). Innovative Intestification of Testing of Strength Endurance in Physical Education of Students with Chronic Diseases. *Teorìâ Ta Metodika Fìzičnogo Vihovannâ*, 19(3), 116- 122. DOI: 10.17309/tmfv.2019.3.02.

Kuźbik, P., & Wronka, A. (2021). Sport digitization management based on the example of physical education classes at the University. *Journal of Physical Education and Sport*, Vol 21 (Suppl. issue 2), Art 152, pp. 1197-1202. DOI:10.7752/jpes.2021.s2152

Loia, V., & Orciuoli, F. (2019). ICTs for exercise and sport science: focus on augmented reality. *Journal of Physical Education and Sport*, Vol 19 (Supplement issue 5), Art 254, pp. 1740 – 1747. DOI:10.7752/jpes.2019.s5254

Mishchenko, N. Yu., & Svetikov, M.B. (2020). Professional training of volleyball coaches for the use of information and communication technologies (ICT) in future practical activities. *Physical culture and sports: science, education, technologie*s. Materials of the VIII All-Russian scientific-practical conference of undergraduates and young scientists dedicated to the 50th anniversary of Ural State University of Physical Culture (Chelyabinsk, April 9, 2020). Ed. N. Yu. Mishchenko, E. V. Bykova. Chelyabinsk: Ural State University of Physical Culture, 107-111(in Russian)

MultiSport Index (2020). Physical activity of Poles in need of support. Available from: https://www.benefitsystems.pl/onas/biuroprasowe/raport/?tx_news_pi1%5Bnews%5D=7051&tx_news_pi1%5Bcontroller%5D=News&tx_news_pi1%5Baction%5D=detail&cHash=70f20f28c37ac38ccf45a895a173cda7

Nowak, M. (2019). Cyfryzacja - na czym polega i jaka ma być z niej korzyść dla przedsiębiorcy. Available from: https://digitalandmore.pl/cyfryzacja-na-czym-polega-i-jaka-ma-byc-z-niej-korzysc-dla-przedsiebiorcy/

Olkhovskaya, I. V. (2020). Application of information and communication technologies in educational activities of sports educational institutions. *International journal of humanitarian and natural sciences,* 1-2 (40), 37-39.

Porokhovskaya, M.V. (2015). Analysis of the use of information and communication technologies in the field of physical culture and sports. *Vitebsk State University Bulletin*, 2-3 (86-87), 99-107

Seshadri, D. R., Drummond, C., Craker, J., Rowbottom, J. R., & Voos, J. E. (2017). Wearable devices for sports: New integrated technologies allow coaches, physicians, and trainers to better understand the physical demands of athletes in real time. *IEEE puls*e, 8(1), 38-43.

Shutova, T., Vysotskaya, T, Efremova, N., & Nosova, A. (2021). Information and digital educational environment for sports at a university (Russian experience). *Journal of Physical Education and Sport*, Vol 21 (2), Art 94, pp. 757-764. DOI:10.7752/jpes.2021.02094

Stefaniak, T., Harmaciński, D., Groffik, B., & Pawlak, G. (2016). Ocena preferowanych predyspozycji trenera personalnego. *Quality in Sport*, 3 (2), 43-53