Journal of Physical Education and Sport ® (JPES), Vol. 23 (issue 4), Art 101, pp. 802 - 809, April 2023
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Development of self-control over the intensity of the running load

MARINA LISTKOVA[1], MIKHAIL KUDRYAVTSEV[2], ALEKSANDER OSIPOV[3], VIKTOR GRUZENKIN[4], LARISA ZAKHAROVA[5], ELENA ROMANOVA[6], MIKHAIL KOLOKOLTSEV[7], ANNA KOSTROMKINA[8], ALEXANDER KOVALEV[9]
[1] Krasnoyarsk State Pedagogical University named after V.P. Astafyeva, Krasnoyarsk, RUSSIA
[2,3,4,5] Siberian Federal University, RUSSIA
[2] Reshetnev Siberian State University of Science and Technology, RUSSIA
[3,2] Siberian Law Institute of the Ministry of Internal Affair of Russia, RUSSIA
[3]Voino-Yasenetsky Krasnoyarsk State Medical University, Krasnoyarsk, RUSSIA
[6] Altai State University, Barnaul, RUSSIA
[7] Irkutsk National Research Technical University, Irkutsk, RUSSIA
[8]Ugra State University, Khanty-Mansiysk, RUSSIA
[9]Immanuel Kant Baltic Federal University, Kaliningrad, RUSSIA

Published online: April 30, 2023
(Accepted for publication April 15, 2023)
DOI:10.7752/jpes.2023.04101

Abstract:
The issues of improving the management and control over the intensity of physical exertion of a running orientation in educational and training process of students has an important scientific and practical interest. *The aim of the research:* to develop and test a methodology for developing students' ability to self-control over the intensity of physical exertion in a running exercise in physical education (PE) classes. ***Materials and methods.*** The research was carried out in the large universities of Siberian Federal District (Russia). Sixty-nine male students took part in the research. Participants ran for 10 minutes within the limits of heart rate (HR) = 132–144 bpm. In time of testing, HR was measured seven times. According to the formulas proposed by us, we calculated the intensity of running physical activity, according to the selected border of the aerobic zone (132–144 beats/min). Participants were trained in the ability to regulate their running speed at HR = 22–24 beats, which corresponds to 132–144 beats/min. The assessment of the accuracy of the completed running task was the arithmetic mean of the deviation from the aerobic limits of HR. ***Results.*** There were that the development of the ability to regulate the intensity of the running load proportional to HR is possible during 8 training sessions in PE classes. The most effective result of this research was obtained in a group of participants who used the method of independent calculations and scheduling of their running tests. These participants, the degree of the average deviation of HR from the established intensity was the smallest and = 4.0 ± 2.0 beats/min, in contrast to other group, where the deviation indicator HR = 13.0 ± 6.0 beats/min ($p < 0.05$). ***Conclusions.*** On the basis of obtained results, was confirmed the need to form students' ability of self-control in managing the intensity of physical exertion in proportion to HR when using a running exertion in PE classes and when performing independent running loads.
Key Words: **physical activity (PA), physical education (PE), running exertion, heart rate, self-control, students**.

Introduction

The educational training of students of their future profession is accompanied by high mental and psycho-emotional loads against the background of an increase in influence of negative risk factors for diseases (Kashina et al., 2023; Semiz, Baran, & Ince, 2022). The current scientific knowledge indicate that the most common risk factor was insufficient PA of students' youth (Osipov et al., 2023; Ma et al., 2020; Osipov et al., 2018). A significant amount of time for development of educational disciplines taught in university can have a negative impact on rational combination of work and rest regime. The use of computer technologies in educational process and leisure activities is increasing, which limits the possibility of students using regular PA (Glazkova et al., 2023). The students' quality of life is closely related to their health, which has a significant impact on effectiveness of mastering academic disciplines and the academic performance of students (Prasad et al., 2021; Kudryavtsev et al., 2016). Significant lack of sleep, eating disorders (Junger et al., 2020), constant psychoemotional overload, the appearance of bad habits at this age (Pengpid, & Peltzer, 2019) negatively affect the health of youth (Mintarto et al., 2021).

Successful adaptation of students to educational process in university, maintaining a high level of health and working capacity are closely interrelated with compliance with basics of a healthy lifestyle and mandatory performance of systematic physical activity in physical education classes and independent regular PA (Apaychev

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

et al., 2018). The use of different means and methods of athletics in PE classes develops basic motor qualities of a person, increases the body's tolerance to physical activity as a result of an increase in level of reserve capabilities of cardiorespiratory system (Yan Hongwei, Ayatullah Muhammad Resza, 2021; Zach et al., 2017). *Bell, & Stephenson,* (2014) reported that running loads develop psychological qualities in a person: personal success, joy, satisfaction, competitiveness, self-esteem and purposefulness. It is generally believed that running exertion is most effective cyclic exercise for maintaining and strengthening human physical health and is widely used as a means of PE (Besomi et al., 2017). Often running exercises of a health-improving orientation are used for self-employment of human population, including students' youth (Nagovitsyn et al., 2021).

Listkova, (2019) state that a significant number of students have a negative attitude to running exertion. As a rule, such students begin to perform a running load in high speed. This causes them to rapidly develop fatigue, the appearance of unpleasant symptoms, emotional discomfort and unwillingness to continue running (Listkova, 2019). This leads to students switching to walking and stopping traffic. Violation of key pedagogical principle of "gradual increase in PA" leads to a decrease in health-improving effect of running exertion on cardiorespiratory system of students. This is especially evident in students who do not have the knowledge and skills to manage the level of intensity of physical activity (Mohd-Liza et al., 2022).

In current, various wearable electronic controls have become widely used among population, which make it possible to effectively regulate the volume and intensity of PA (Nagovitsyn et al., 2020; Hirsh, 2018). However, students do not always have the financial opportunity to purchase special monitoring devices for educational and independent PE classes. We believe that a way out of this situation is possible by searching for simple, accessible and sufficiently informative methods of self-monitoring the level of intensity of physical activity performed. Despite the available methods of monitoring the intensity of physical exertion when performing running exercises, for example, using the indirect method of determining VO2max (Mintarto et al., 2021), monitoring the affective reaction of the body (Mohd-Liza et al., 2022) in scientific literature, the issues of using simple methods for monitoring the functional indicators of heart activity are insufficiently covered. We believe that the solution of the issue of using control over the level of intensity of running exertion with calculations from the proposed methodology will increase health potential of running exertion and motivation for physical activity.

The aim of the research: to develop and test a methodology for developing students' ability to self-control over the intensity of physical exertion in a running exercise in physical education classes.

Material & methods

This scientific work was carried out in the Departments of Physical Education of the large Universities in the Siberian Federal District of Russian Federation. At first time, all participants (sixty-nine male students) were trained to register HR, then they performed a 10–minute run within the limits of HR = 132-144 beats/min, which corresponds to an aerobic energy supply regime (Listkova, 2019). During testing, HR was measured seven times: at the end of the 1st, 2nd, 3rd to 4th minute, and after the 6th, 8th and 10th minute of running exertion.

All participants were asked to independently control the intensity of running exertion by adjusting the speed of running. The speed should be chosen in such a way that HR in 10 sec was equal to 22-24 beats/10 sec, which corresponds to HR = 132-144 beats/min. The objective characteristic of the accuracy of self-monitoring by assessing the sensations of running intensity in interval HR = 132-144 beats/min was the arithmetic mean of deviation from the established limits of aerobic exercise. The indicator of the accuracy of self-assessment of the sensations of running intensity was found as the sum of the differences between the results exceeding 144 beats/min, + the sum of the differences between HR less than 132 beats/min. The resulting sum of the difference was divided by the number of measurements (n=7).

$$K = \frac{\sum(Nlov - Yi) + \sum(Xi - Nup)}{n}$$

"**K** is the arithmetic mean value of the deviation of HR from the aerobic zone (132-144 beats/min); **Yi** –HR is less than the lower limit; **Xi** –HR, more than the upper limit; **N** low is the value of the lower limit of HR = 132 beats/min; **N** up is value of the upper limit of HR = 144 beats/min; **n** is number of HR measurements in test (n=7).

We have identified a relationship between the value of deviation from HR intervals and the degree of development of the ability to self-control running speed ("**K**"). The smaller the deviation from the specified HR interval, the better the student's speed of running control skill is developed.

The assessment of the reliability of the results obtained by us was evaluated using the "test-retest" method. For this purpose, a recheck of the correlation calculation of the final indicators of two tests was carried out after two weeks. Repeated control testing showed high reliability and reliability of this method, r = 0.94, at $p < 0.05$.

The performance of running load by participants for 10 minutes in all cases of HR measurement is evaluated as an accurately completed task. At the same time, there are several variants of deviation from upper and lower boundaries of aerobic zone (Fig. 1-4).

HR values in all measurements exceed the upper aerobic zone = 144 beats/min (Figure 1).

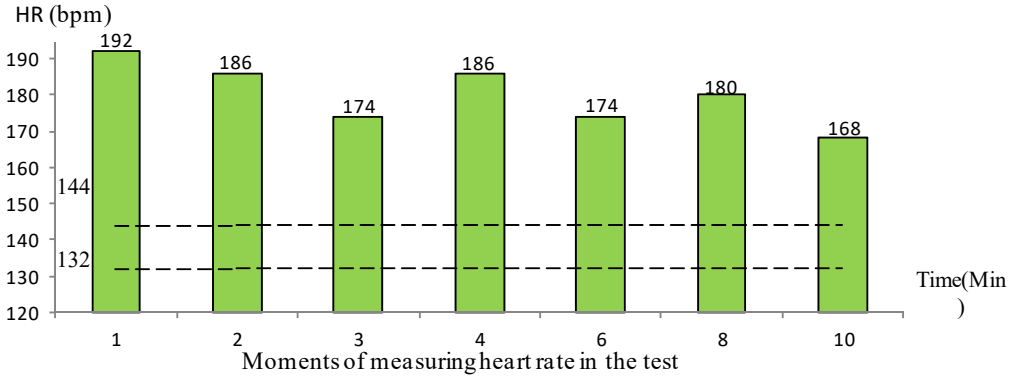

Fig. 1. HR is more than aerobic limit of running load

In this case, the calculation of coefficient "**K**" was carried out by the formula:

$$K = \frac{\sum(Xi - Nup)}{n}$$

HR dynamics is less than lower aerobic load limit = 132 beats/min, shown in Figure 2.

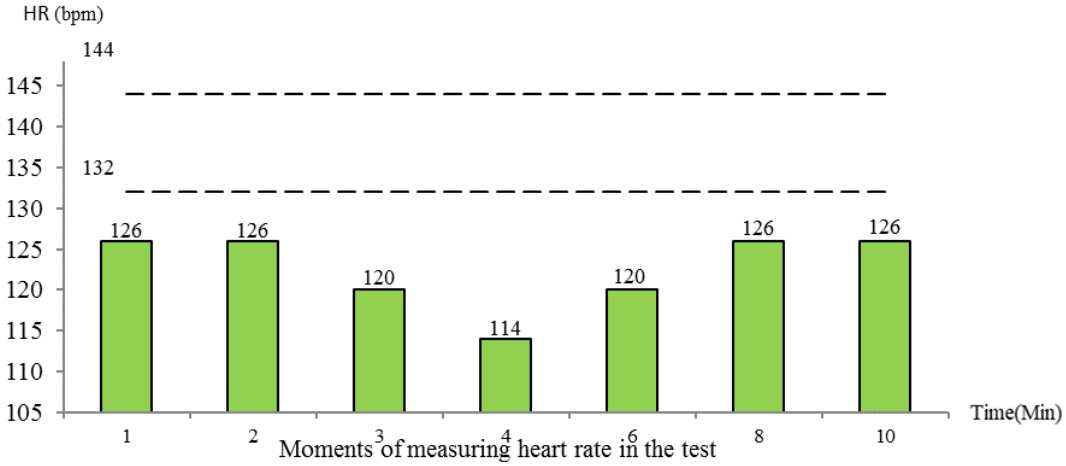

Fig. 2. HR below the aerobic limit of running load (running during 10 min)

In this case, the calculation of coefficient "**K**" was carried out by the formula:

$$K = \frac{\sum(Nlov - Yi)}{n}$$

The next stage of investigation involved testing and studying the effectiveness of the proposed method of self-control over the intensity of PA in a running exertion in PE classes. Two methods of developing the skill of self-control of running load regulation were tested. Two groups of participants were formed: EG-1 (n=34) and EG-2 (n=35), who had approximately the same level of physical fitness. All participants were taught the measurement of HR, explained the condition for performing a running test, conducted theoretical seminars on the significance and health benefits of running exertion. The observation was carried out during 8 PE classes. The both groups were tasked with controlling the running speed for 10 minutes, so that during its execution HR was in the range of 132-144 beats/min. HR registration according to the above description with the calculation of the coefficient "**K**" – an estimate of the level of deviation of HR from the established load limits. This coefficient was considered as a criterion for the effectiveness of the method of forming students' ability to differentiate feelings of intensity of physical activity in running exertion (Listkova, 2019).

All participants gave their voluntary written consent to participate in the experiment, which does not violate the principles of the Helsinki Declaration of 2008. The data obtained were processed using statistical computer programs STATISTICA 10.0 (MS Excel 2010). Data of research were expressed as the mean ± standard deviation (SD) for all variables. Independent t-test to compare differences between studied variables was performed. For this research, the level of significance was set at $p < 0.05$.

Results

The calculation of the coefficient "**K**" in the subjects of both groups had significant differences (up to 37.0 ± 12.0 beats/min) from a given load. This indicated the need for formation of the ability to self-control the intensity of running load in proportion to HR.

When participants performing running exertion, we identified four types of changes in HR vector. With this in mind, we divided the participants into four conditional groups.

The first group included participants whose HR values all exceeded the established upper limit of the aerobic zone = 144 beats/min (Figure 3).

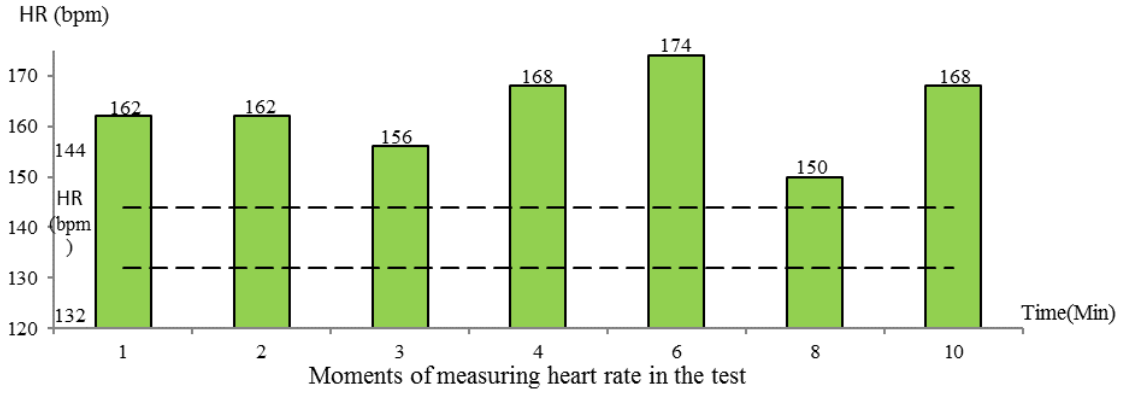

Fig. 3. Values of HR indicators for participants of the first group

Such participants were asked to pay attention to reducing the speed of running to HR = 22-24 beats/10 sec.

The second group included participants whose HR values were all less than lower aerobic limit = 132 beats/min (Figure 4).

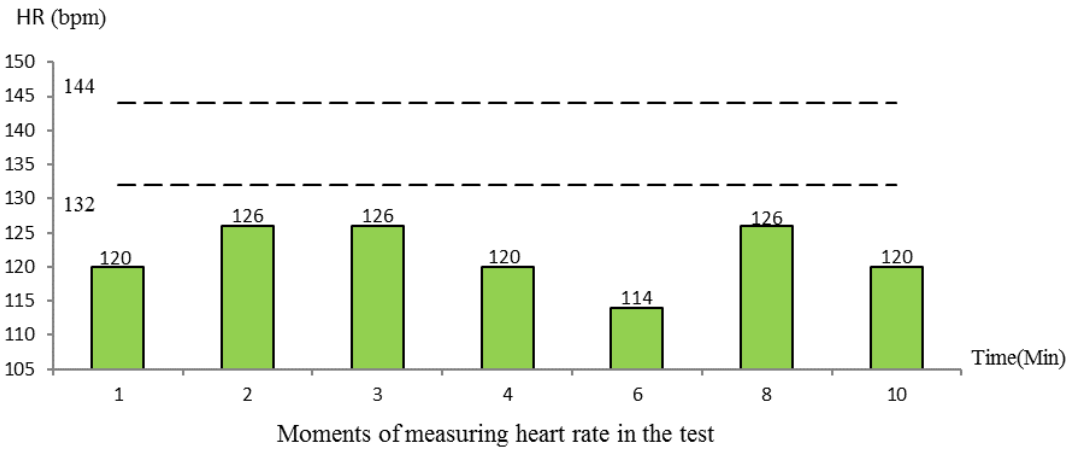

Fig. 4. Values of HR indicators for participants of the second group

Participants of the second group were asked at the beginning of a 10-minute running load to pay attention to a higher speed of passing the distance and to further maintain such a pace, focusing on HR = 22-24 beats/10 secs with each calculation. In the third group of participants, values of HR indicators had an increasing trend (Figure 5).

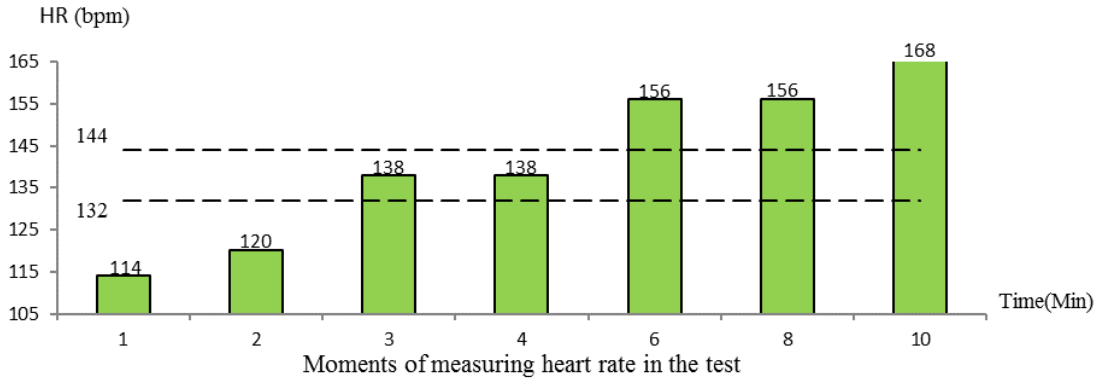

Fig. 5. Values of HR indicators for participants of the third group

Participants, who performing a running exertion with presented HR dynamics were recommended to pay attention in beginning of race to a higher speed, then keeping pace of running and maintaining HR 22-24 beats/10 sec at each moment of pulse measurement.

Values of HR indicators in participants of the fourth group, were characterized by decreasing HR dynamics (Figure 6).

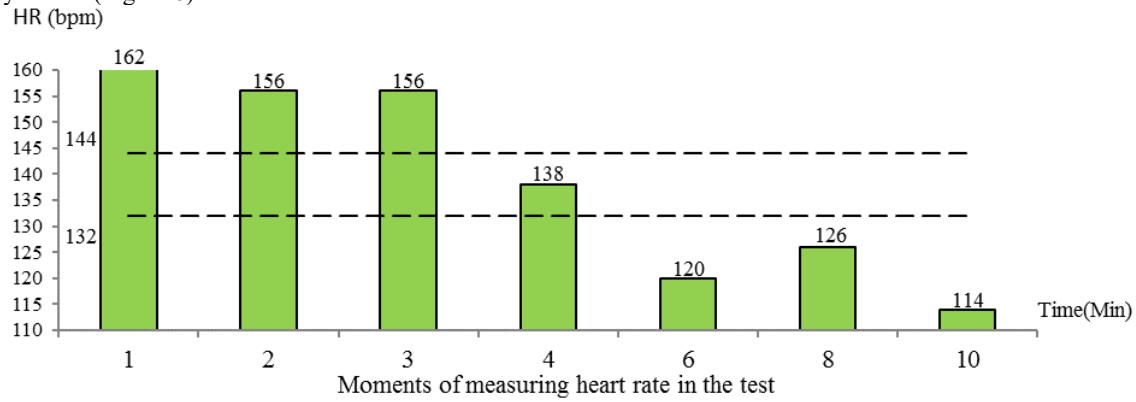

Fig 6. Results of the fourth group (HR is characterized by a decreasing vector)

Participants of this group were instructed to start running at a calm pace, then keeping the speed and focusing on each count HR = 22-24 beats/10 sec.

Deviations of the values of the HR index from aerobic boundaries in participants (EG-1 and EG-2) during 8 PE classes are shown in Figure 7.

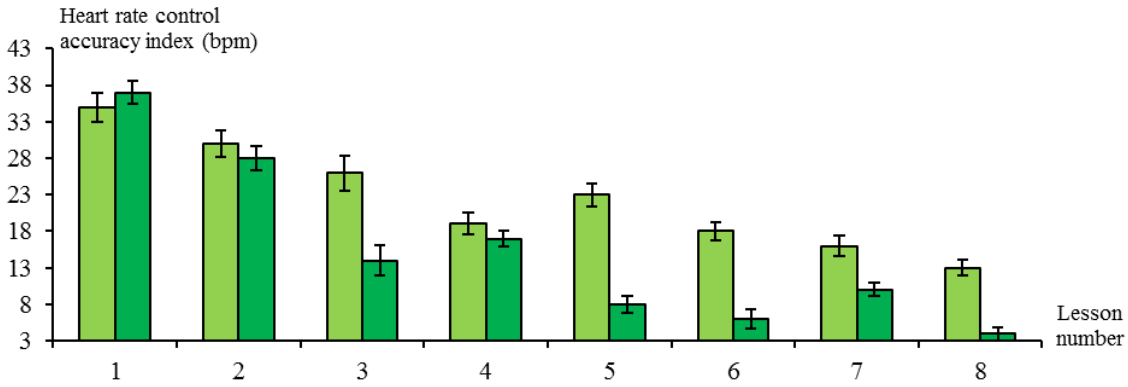

Fig. 7. The degree of HR management accuracy among participants (EG-1 and EG-2)

No – -1 – EG-2.

There were found that EG-1 and EG-2 participants, over the course of eight classes, the degree of the average deviation of HR from the set boundaries tended to decrease the values of indicators. The most pronounced decrease in the average deviation of HR from the set boundaries was registered in EG-2 compared to EG-1. In EG-2, the value of HR deviation from the set intensity "**K**" was 4.0 ± 2.0 beats/min and was 3.25 times less than in EG-1, in which the value of the coefficient "**K**" was 13.0 ± 6.0 beats/min ($p < 0.05$). The results of these observations indicate a more accurate regulation of the speed of running by participants (EG-2), which indicates a higher efficiency of the experimental methodology for the formation of the ability to self-control the intensity of running exertion in PE classes.

In the course of this investigation, we registered that performance of HR self-monitoring by participants in running, independent calculations and construction of graphs of their tests allowed participants (EG-2) to more effectively perform the tasks of forming the regulation of the speed of running load. We have noted the formation of a meaningful interest among participants (EG-2) in running exertion, which develops a motivational component for regular physical activity.

Dicussion

This scientific work shown that in process of performing a running exertion in PE classes, male students have poorly developed knowledge and skills to control the speed of running and, accordingly, the intensity of the load, respectively HR. The inability to manage physical exertion can lead to the transition of body from an aerobic to an anaerobic mode of performing physical exertion. This causes a significant load on the cardiorespiratory system, can cause the development of fatigue and overtraining of students' body. This reduces the motivational component and the wellness potential of physical activity. To control the level of intensity of running load, a method of developing self-control and regulation of speed of running in proportion to HR is proposed. This method, can be used in other educational institutions to obtain a higher health-improving result among young people and students' youth. Analysis of results of this investigation shows that the proposed method of developing the skill of self-control of the level of running load in proportion to HR proved to be effective. The implementation by participants of independent calculations of the coefficient "**K**" according to proposed formulas with an illustration of HR change graphs led to a decrease in value of indicator of degree of average deviation of HR from established intensity. In EG-2, the deviation was 4.0 ± 2.0 beats/min. In EG-1, where only the ability to regulate the speed of running load was formed, the HR deviation index was 3.25 times higher – 13.0 ± 6.0 beats/min ($p < 0.05$).

The use of methods and means of athletics exercises in PE of students' youth has a strong positive effect on development of motor skills and qualities, increasing reserve capabilities of cardiorespiratory system (Yan Hongwei, Ayatullah Muhammad Resza, 2021; Zach et al., 2017) and formation of a motivational component to increase of motor activity, including performing independent running exertion. With the mass use of athletics exertion in the educational process of PE, the response of the cardiovascular system to the task being performed is not actively taken into account. Such PA leads male students to the rapid development of fatigue, causes a decrease in the efficiency of body, which in general negatively affects the health-improving effect of PE. We believe that the use of the proposed methodology for the formation of students' ability to regulate the speed of running load will be solved more effectively if students have the ability to differentiate intensity of running in proportion to HR. Insufficient ability to regulate intensity of running load can lead to transition of this exertion from aerobic to anaerobic orientation. With insufficient physical fitness of male students, the transition to such a motor mode can lead to an overload of the cardiorespiratory system of students (Pavlenko, & Pavlenko, 2020) and cause fatigue or overtraining of young males. Low indicators of physical fitness of youth, as indicated by *Zhang, et al.* (2019), *Setiakarnawijaya, et al.* (2021) and results of our observations indicate importance of teaching students the methodology of developing the ability to self-control of speed of running in proportion to HR. The experimental data do not contrast the study by *Miller, et al.* (2019), who used self-monitoring of affective responses to regulate speed of running, when performing high-intensity interval training of runners. However, these investigators did not evaluate the response of cardiovascular system to running load. We believe that one of important advantages of proposed method of teaching students to correct physical exertion in proportion to HR is the possibility of using it in running exertion of male students in conditions of independent motor activity of young males (Listkova, 2019).

The use of wearable electronic devices by students to regulate intensity of physical exertion is not always feasible, due to financial difficulties among youth. According to our survey of male students, was found that all 50 respondents cannot purchase gadgets for use in running exertion. It is difficult to purchase electronic devices at the expense of an educational institution or university. With the cost of a digital heart rate monitor of 5000 rubles, the university needs to spend over 1 million rubles on the purchase of only 200 devices. This data is consistent with the opinion of other investigators (Lizandra et al., 2020), who argue that there is no need to provide each student with an individual monitoring device to obtain reliable information. Students can use simple, affordable and effective methods of self-monitoring the intensity of running loads, which can include the methodology we have proposed.

We are investigated that method of forming the ability of self-control to intensity of running exertion in proportion to HR, allowed to effectively control the running load, which increased the health potential of PE classes in universities and the motivation of male students for physical activity

Conclusions

This scientific work confirmed the need to form students' ability of self-control in managing the intensity of physical exertion in proportion to HR when using a running exertion in PE classes and when performing independent running loads. Investigation shown that formation of developing the skill of self-control of the level of running load in proportion to HR proved to be effective for decrease in value of indicator of degree of average deviation of HR from the established intensity of running exertion.

Conflicts of interest. The authors declare no potential conflict of interest.

References:

Apaychev, O., Zakharina, I., Hrybovska, I., Pityn, M., & Hrybovskyy, R. (2018). Fitness correction of men using an outdoor activity. *Journal of Physical Education and Sport*, *18*(4), 2382-2388, doi:10.7752/jpes.2018.04359

Bell, N., & Stephenson, A. (2014). Variation in motivations by running ability: using the theory of reasoned action to predict attitudes about running races. *Journal of Policy Research in Tourism, Leisure and Events, 6*(3), 231-247, doi:10.1080/19407963.2014.933227

Besomi, M., Leppe, J., Martínez, M., Enríquez, M., Mauri-Stecca, M., & Sizer, P. (2017). Running motivations within different populations of Chilean urban runners. *European Journal of Physiotherapy*, 19(sup1), 8-11, doi:10.1080/21679169.2017.1381317

Glazkova, G., Lubyshev, E., Mamonova, O., & Pukhovskaya, M. (2023). Students' attitude to physical activity under blender learning. *Teoriya i Praktika Fizicheskoy Kultury, 1*. 59-61.

Hirsh, A. (2018). Technology on the run: Promoting active behavior in diverse ICT-supported physical education classes. doi:10.14746/SE.2018.47.21, Corpus ID: 202353519

Junger, J., Junger, A., & Ostrowski, P. (2020) Body composition of trainees undergoing EMS training with respect to their nutrition. *Journal of Physical Education and Sport, 20*(1), 97-101. doi:10.7752/jpes.2020.01012

Kashina, Y., Pokrovskiy, V., Cherednik, I., & Burlutskaya, A. (2023). Comprehensive assessment of adaptation to university among students. *Human. Sport. Medicine, 23*(1), 73-79, doi:10.14529/hsm230110

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

Kudryavtsev, M., Kramida, I., & Osipov, A. (2016). Influence of monitor bad habits on healthy lifestyle of students. *Teoriya i Praktika Fizicheskoy Kultury, 6*, 24-26.

Listkova, M.L. (2019). Software and methodological support of independent physical education classes for students at the university. PhD Thesis. Krasnoyarsk, Astafyev University. Retrieved from https://www.kspu.ru/upload/documents/2019/08/30/0c323c88383592bc219dce5a5c3b11f1/listkova-ml-avtoreferat-na-sajt.pdf

Lizandra, J., Valverde-Esteve, T., & García-Massó, X. (2020). Use of mobile devices as a facilitator of the practice of physical activity in physical education lessons: experience in higher education. *Journal of Physical Education and Sport*, *20*(6), 3629-3634, doi:10.7752/jpes.2020.06489

Ma, C., Zhou, L., Xu, W., Ma, S., & Wang, Y. (2020). Associations of physical activity and screen time with suboptimal health status and sleep quality among Chinese college freshmen: A cross-sectional study. *PLOS ONE, 15*(9), e0239429, doi:10.1371/journal.pone.0239429

Miller, J., Van Hooren, B., Bishop, C., Buckley, J., Willy, R., & Fuller, J. (2019). A systematic review and meta-analysis of crossover studies comparing physiological, perceptual and performance measures between treadmill and overground running. *Sports Medicine, 49*(5), 763-782, doi:10.1007/s40279-019-01087-9

Mintarto, E., Agung Pramono, B., & Septiani Mustar, Y. (2021). Indirect estimation of fitness level through assessing maximal oxygen uptake using the 1-mile and 2000-meter jogging protocols. *Journal of Physical Education and Sport, 21*(3), 1561-1566, doi:10.7752/jpes.2021.03198

Mohd-Liza, S., Connolly, L., Muhamad, A., & Malik, A. (2022). Perceptual responses and running performance during treadmill and overground self-paced interval running in moderately active adults. *Journal of Physical Education and Sport, 22*(1), 216-224, doi:10.7752/jpes.2022.01028

Nagovitsyn, R., Osipov, A., Loginov, D., Prykhodov, D., & Vapaeva, A. (2020). Individual system of self-monitoring of the daily motor activity of athletes. *Journal of Human Sport and Exercise, 15*(2proc), S118-S128, doi:10.14198/jhse.2020.15.Proc2.01

Nagovitsyn, R., Osipov, A., Ratmanskaya, T., Loginov, D., & Prikhodov, D. (2021). The program for monitoring students' walking and running according to the system "10,000 steps a day" during the spread of COVID-19. *Journal of Human Sport and Exercise, 16*(3proc), S864-S873, doi:10.14198/jhse.2021.16.Proc3.03

Osipov A., Orlova I., Ratmanskaya T., Nagovitsyn R., Lyakh V., & Kudryavtsev M. (2023). Physical activity, national nutrition and health education in the university environment aimed at preventing Russian male students' overweight/obesity (mini-review). *Journal of Siberian Federal University. Humanities & Social Sciences, 16*(2), 303-314.

Osipov, A., Iermakov, S., Gruzinky, V., Kudryavtsev, M., Bliznevsky, A., Bliznevskaya, V., Serzhanova, Z., Kuzmin, V., Zhavner, T., Vapaeva, A., Markov, K., & Kondrashova, E. (2018). Analysis of the parameter changes of students' physical development (at the age of 18–20) to identify the threat of increased body weight and obesity. *Journal of Physical Education and Sport, 18*(2), 800-809, doi:10.7752/jpes.2018.02118

Pavlenko, V., & Pavlenko, Y. (2020). Peculiarities of training and competitive activity of sportsmen-sprinters in track and field athletics. *Journal of Physical Education and Sport, 20*(5), 2695-2700, doi:10.7752/jpes.2020.05367

Pengpid, S, & Peltzer, K. (2019). Sedentary behaviour, physical activity and life satisfaction, happiness and perceived health status in university students from 24 countries. *International Journal of Environmental Research and Public Health*, *16*(12), 2084, doi:10.3390/ijerph16122084

Prasad, L., Fredrick, J., & Aruna, R. (2021). The relationship between physical performance and quality of life and the level of physical activity among the elderly. *Journal of Education and Health Promotion*, *10*(1), 68, doi:10.4103/jehp.jehp_421_20

Semiz, K., Baran, E., & Ince, M. (2022). Restructuring a university health-related physical activity course with technology: a design-based research. *Pamukkale Journal of Sport Sciences, 13*(3), 191-216, doi:10.54141/psbd.1166034

Setiakarnawijaya, Y., Safadilla, E., Rahmadani, E., Robianto, A, & Fachrezzy, F. (2021). Android-based physical fitness software guidance. *Journal of Physical Education and Sport, 21*(Suppl. 4), 2313-2319, doi:10.7752/jpes.2021.s4295

Yan Hongwei, & Ayatullah Muhammad Resza. (2021). Running motivations of non-elite long-distance runners in Indonesia. *Journal of Physical Education and Sport*, *21*(Suppl. 4), 2288-2294, doi:10.7752/jpes.2021.s4291

Zach, S., Xia, Y., Zeev, A., Arnon, M., Choresh, N., & Tenenbaum, G. (2017). Motivation dimensions for running a marathon: A new model emerging from the Motivation of Marathon Scale (MOMS). *Journal of Sport and Health Science*, *6*(3), 302-310, doi:10.1016/j.jshs.2015.10.003

Zhang, Z., Chen, B., & Chen, W. (2019). The mediating effect of perceived health on the relationship between physical activity and subjective well-being in Chinese college students. *Journal of American College Health,* 1-8, doi:10.1080/07448481.2019.1645676