Journal of Physical Education and Sport ® (JPES), Vol. 24 (issue 1), Art 4, pp. 29 - 35, January 2024
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Results of testing an improved methodology for assessing the dynamic performance of rural population in Belarus

PAVEL SNEZHITSKY[1], ELENA ROMANOVA[2], ALEXANDER BOLOTIN[3], VIKTOR KRAYNIK[4], EVGENIYA KETRISH[5], TATYANA ANDRYUHINA[6], NINA ARNST[7], PAVEL TYUPA[8], SERGEY AGANOV[9], IRINA PLOTNIKOVA[10]
[1] Grodno State Agrarian University, Grodno, REPUBLIC OF BELARUS
[2] Altai State University, Barnaul, RUSSIA
[3] Peter the Great St. Petersburg Polytechnic University, St. Petersburg, RUSSIA
[4] Altai State Pedagogical University, Barnaul, RUSSIA
[5] Ural Federal University named after the First President of Russia B. N. Yeltsin, Ekaterinburg, RUSSIA
[6] Russian State Professional Pedagogical, Ekaterinburg, RUSSIA
[7] Reshetnev Siberian State University of Science and Technology, Krasnoyarsk, RUSSIA
[8] Immanuel Kant Baltic Federal University, Kaliningrad, RUSSIA
[9] GPS Emercom of Russia St. Petersburg University, RUSSIA
[10] Irkutsk State University, RUSSIA

Published online: January 31, 2024
(Accepted for publication January 15, 2024)
DOI:10.7752/jpes.2024.01004

Abstract:
Recently, as a result of physical inactivity, modern man has experienced a decrease in his level of physical condition, including among rural residents. The development of innovative pedagogical methods for diagnosing dynamic human performance, which are generally accessible, informative and easy to implement, continues to be an urgent problem. ***Purpose****:* to develop and test an innovative method of pedagogical diagnostics of dynamic performance, based on individual ranking of functional indicators of the human body. ***Material & methods***. The study was carried out on the basis of 24 educational institutions of general secondary education in the Brest, Grodno and Minsk regions of the Republic of Belarus. 2334 rural residents aged from 6 to 75 years were examined. To assess physical performance, a complex physical exercise was used, which included performing three tests each lasting 1 minute. The test used was push-ups, sit-ups and squats. Among the functional indicators, we used the measurement of heart rate before and after performing a complex physical exercise for 15 seconds during different periods of pulse recovery after performing the load, with the calculation using the proposed formula of a complex indicator of heart rate, height, pulse reaction and pulse value of the recovery period. The assessment of the individual rank of a person's dynamic performance was carried out according to the proposed formula, taking into account the values of the indicators of the individual rank of complex physical exercise (number of times) and the individual rank of the height of the pulse response to complex physical exercise and the pulse value of the recovery period (bpm). ***Results***. We have developed and tested an innovative method of pedagogical diagnostics of dynamic human performance, on the basis of which we assessed the functional state of rural residents of the Republic of Belarus. The level of dynamic performance in the rural community was 8.45% (1 point or low level) for female representatives and 6.72% (1 point or low level) for male representatives. Analysis of the data obtained allows us to conclude a decrease in the function of the main functional systems of the body of rural residents, ensuring dynamic performance. ***Conclusions****.* According to the results of the study, the innovative methodology for pedagogical diagnostics of the dynamic performance of rural residents is publicly available, quite informative and easy to implement. The methodology we have developed is the basis for its mass application in the field of physical education.
Key Words*:* **physical exercise, physical activity, dynamic performance, functional state, rural residents**

Introduction

The concept of "human functional state" was introduced into the lexicon by physiologists in the thirties of the 20th century. Currently, in relation to various scientific fields, this concept has many semantic shades in its interpretation (Kemerova, & Kerimova, 2020). In the field of physical culture, the "functional state of a person" seems relevant and is considered as an important component in the organization of a person's daily motor activity. It is an integration characteristic of the adaptive, energetic and reserve capabilities of the main functions of the body. These functions directly or indirectly determine the efficiency of a person's motor sphere. The level of development and current state of the functional systems of the human body is assessed in the process of medical and pedagogical control for admission to educational or training classes in physical education

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

or sports (Butakova et al., 2019; Mischenko et al., 2020; Kolokoltsev, 2021). Such control is necessary for admission to competitions or permission to resume training after the athlete's rehabilitation.

The cardiovascular system plays a key role in assessing a person's functional performance (Shved, & Levitska, 2018; Bellenger & Buckley, 2021; Grassler et al., 2021). The functional characteristics of this system serve as one of the first signals when overexertion, overtraining or overwork of the body associated with physical overload occurs (Sergio Jiménez Morgan, José Arturo Molina Mora, 2017). The state of this system indicates the course of the body's recovery processes after exercise (Dupuy & Dugué, 2018), which is important to consider when planning sports or physical education. The use of methods for monitoring the state of functional indicators of people performing physical activity allows us to individualize the process of physical education (Koryahin, 2018), which has a positive effect on a person's health. The state of physical and mental performance, its success in learning, work and creativity depend on the functional level (Kolpakova, 2018). This allows us to reasonably assume that assessing the level of functional state as an integral component of a person's physical health should be an integral part of a comprehensive assessment of his motor culture (Snezhitsky et al., 2022; Bocharin et al., 2023). Various methods have been proposed to diagnose the state of functional systems. Such methods range from simple ones, for example, 20 squats in 30 seconds, which do not require complex equipment, to instrumental or biochemical ones, which have a fairly high information content, but limited possibility of use in mass examinations. The latter include a method for studying heart rate variability (Christiani et al., 2021; Bocharin et al., 2022). Therefore, the search for methods for rapid and reliable assessment of the functional state of the body using non-invasive methods continues to be relevant (Adams et al., 2018; Aparecida Maria Catai et al., 2020). One of these methods may be to use the method of individual ranking of the values of indicators of the functional state of the human body. In the scientific literature, this method of diagnosing a person's functional state is not fully covered. This is especially important when conducting screening examinations of a large number of people. We believe that our proposed method for determining dynamic performance, which is based on the use of individual ranking of functional indicators of the human body, will make it possible to effectively use it in mass examinations of various population groups.

Research aims to develop and test an innovative methodology for pedagogical diagnostics of dynamic performance, based on individual ranking of functional indicators of the human body.

Material & methods

The dynamic performance of 2334 rural residents aged 6 to 75 years was assessed on the basis of 24 secondary educational institutions in the Brest, Grodno and Minsk regions (Republic of Belarus). For assessment, a complex physical exercise (CPE) was used, which included performing three tests each lasting 1 minute. The test used was push-ups, sit-ups and squats. Testing was performed in the gym (or at home or work) with comfortable clothing that did not restrict movement. A height-adjustable crossbar (well-fixed table), a gymnastic mat or a fitness mat were used. The unit of measurement was one repetition cycle of each control exercise. The control test "flexion and extension of the arms in a prone position" included push-ups from a bar that was securely fastened at the level of the subject's waist (or from a window sill, desk, dining table, back of a chair or any other similar object with a height of 90±10 cm). Starting position - lying on the crossbar (or other object indicated above). At the tester's command, the test subject bends his arms at the elbow joints until his chest touches the crossbar. After this, it completely straightens the joints and returns to its original position. The exercise continues at the maximum (or close to it) pace, which is determined by the subject himself. During the control exercise, the torso maintains a straight position (does not bend or sag). At the end of the first minute, the tester gives the command "Transition" and the subject immediately, without delay, changes the starting position and begins to perform the second exercise "extension and flexion of the torso from a supine position with arms on shoulders" (or "raising the torso from a lying position"). The starting position is sitting, arms bent at the elbows, hands on the shoulders, legs bent at the knees at an angle of no more than 90° and no less than 45°, the subject's feet are pressed to the floor by an assistant. After taking the starting position at the tester's command, the test subject performs body extension until both shoulder blades touch the floor in a supine position with his hands behind his head. After this, the subject lifts his torso into a sitting position, touching his knees with his elbows. The exercise is performed at the maximum possible pace, and the tester continues to count repetitions in a single flow, without interrupting it after completing the first exercise. After the second minute, the tester gives the command "transition" and the test taker, without a pause for rest, immediately takes the starting position to perform the third exercise "squats". Starting position – feet shoulder-width apart, hands together in front at waist level. On command, the subject bends his legs at the knee joints, leaning forward slightly (45±10°) until his fingers touch the floor. After touching the floor, the subject returns to the starting position. When performing the third exercise, the subject tries to maintain the maximum possible tempo of the load. The tester continues the "through" counting of repetitions until the end of the last (third) minute of performing all three exercises.

Of the functional indicators, we used the measurement of heart rate (HR) before exercise (P_0) and after performing a complex physical exercise for 15 seconds at different periods of heart rate recovery after performing the tests. The complex indicator of heart rate (CIHR), pulse response height (HPR) and pulse value of the recovery period (PVRP) were calculated using formula 1:

CIHR = (∑ (P_h, P_1, P_2, P_3, P_4, P_5) - (P_0 × 6)) × 4 *(formula 1)*

(P_h) – heart rate immediately after physical activity in the first 15 seconds of the first minute of recovery; (P_1) – heart rate in the last 15 seconds of the first minute of recovery; (P_2) – heart rate in the last 15 seconds of the second minute of recovery; (P_3) – heart rate in the last 15 seconds of the third minute of recovery; (P_4) – heart rate in the last 15 seconds of the fourth minute of recovery; (P_5) – heart rate in the last 15 seconds of the fifth minute of recovery.

To determine the individual rank of a person's indicator (IR%) on the centile scale of the measurements performed, we developed and used formula 2:

IR% = ((x – (Me – ½ R)) / R) × 100 *(formula 2)*

Where: IR% – individual rank of a person's indicator;
x – indicator measured by the number of repetitions of physical exercises;
Me – median (or arithmetic mean) of the basis population;
R – rank (variation range) of the basic population.

The resulting total number of all repetitions of the three types of control exercises was the result of the maximum possible physical load performed by the subject.

The assessment of a person's dynamic performance according to the CFU was carried out using formula 3:

IRDP = (IRCFE + IRHPR) / 2 *(formula 3)*

Where: IR_{DP} – individual rank of dynamic performance, %;
IR_{CFE} – individual rank of the complex physical exercise, number of times;
IR_{HPR} – individual rank of the height of the pulse response to complex physical exercise and the pulse value of the recovery period, beats/min.

Before the start of the mass survey of rural residents, written consent to participate in testing was obtained from the parents of all children, adolescents and tested adults, which does not violate the ethical rules of the 2003 Declaration of Helsinki.

Results

The individual rank of dynamic performance (IRDP) of a person represents the arithmetic mean of the percentile individual rank of the complex physical exercise (IRCFE), the height of the pulse response (HPR) and the pulse value of the recovery period (PVRP). The individual rank of both types of measurements is calculated relative to the values of the arithmetic mean or median of empirical data, calculated earlier as part of a preliminary reference experiment among schoolchildren (n = 279, age 17.35 ± 2.6 years), who were physically active and led a healthy lifestyle. The indicated indicator for the CFE (formula 1) was 112.26 ± 9.43 times (median – 111 times) for female rural residents, and 133.15 ± 11.81 times (median – 134 times) for males. The total arithmetic mean (or median) TPR and PSPV for representatives of the female and male gender for this physical activity did not have significant differences and was equal to 112.65 ± 7.53 beats (median - 113 beats).

Sufficient homogeneity of the values of the CFU indicator was established among representatives of most age groups of the female gender population under study (coefficient of variation from 25.28 to 32.20%). Overall, the entire sample was not sufficiently homogeneous with a coefficient of variation of 36.80%, Table 1.

Table 1. Descriptive statistics of CFE indicators in rural girls, young women and women (number of times)

Age, years	Valid N	Mean	Median	Percentile 25.00	Percentile 75.00	Std	Coefficient of variation	p	$IR_{\%}$, %	R, point
6 – 9	101	81.75	82.00	62.00	101.00	23.19	25.28	0.02	-3.92	1
10 – 14	440	83.83	84.00	54.00	101.00	27.02	31.11	0.00	-0.25	1
15 – 21	163	85.73	82.00	56.00	100.00	31.09	36.26	0.03	3.11	1
22 – 35	176	71.23	64.50	51.00	85.00	22.94	32.20	0.01	-22.52	1
36 – 55	405	68.44	68.00	57.00	73.00	17.87	30.57	0.00	-27.45	1
56 – 75	32	57.84	55.00	48.00	53.00	20.70	43.28	0.05	-46.18	1
6 – 75	1317	71.31	72.00	57.00	96.00	27.71	36.80	0.00	-22.38	1

The individual rank (IR) of the value of this indicator is found in most age groups (except for the age of 15 – 21 years) mainly outside the boundaries of the variation range of the trait, as evidenced by its negative values, Table 1. In the age context, its dynamics have a certain positive trend from 6 years up to 21 years, and then a pronounced decline by 75 years. The values of the 75th percentile of the study sample (53 – 101 times) at

all ages do not exceed the median of the base population (112 times). This indicates a low level of physical condition in these individuals.

Descriptive statistics of the height of the pulse response (HPR) of the female gender to physical activity, as well as the pulse value of the recovery period (PVRP) indicate absolute and sufficient homogeneity of the data among representatives of most age groups of the study population (coefficient of variation from 11.24 to 22.22%), Table 2.

Table 2. Descriptive statistics of pulse response height indicators in rural girls, young women and women during physical activity and after five minutes of recovery (beats/min)

Age, years	Valid N	Mean	Median	Percentile 25.00	Percentile 75.00	Std	Coefficient of variation	p	$IR_{\%}$, %	IR, point
6 – 9	101	119.17	120.00	110.40	120.00	14.13	11.86	0.02	36.13	3
10 – 14	440	124.14	125.00	125.00	125.00	13.95	11.24	0.00	25.23	2
15 – 21	163	118.62	119.00	75.80	119.00	22.19	18.70	0.04	37.34	3
22 – 35	176	115.49	115.00	82.60	116.00	19.79	17.14	0.02	44.21	3
36 – 55	405	111.17	118.40	93.60	118.40	20.81	18.72	0.01	53.69	3
56 – 75	32	111.21	110.60	101.00	111.60	24.71	22.22	0.05	53.70	3
6 – 75	1317	117.74	118.00	107.60	122.00	19.14	16.26	0.00	39.27	3

At the same time, the individual rank in terms of HPR and PVRP for the majority corresponds to average values from 36.13 to 53.70% (3 points), except for the age of 10 - 14 years (IR% = 25.23%), which is two points. The lowest individual rank of dynamic performance ($IR\%_{DP}$) was observed at working age and retirement age. The assessment of the dynamic performance indicator of rural girls, girls and women of the Republic of Belarus as a whole was 8.45%, which corresponds to one point, Table 3.

Table 3. Individual rank of dynamic performance of rural girls, young women and women

Indicators	Age, years						
	6 – 9	10 – 14	15 – 21	22 – 35	36 – 55	56 – 75	6 – 75
$IR_{\%\Sigma\ CCPE}$, %	-3.92	-0.25	3.11	-22.52	-27.45	-46.18	-22.38
$IR_{\%\ HPR\ and\ PVRP}$, %	36.13	25.23	37.34	44.21	53.69	53.6	39.27
$IR_{\%DP}$, %	16.11	12.49	20.23	10.85	13.12	3.71	8.45
IR, point	2	1	2	1	1	1	1

Control complex of physical exercise (CCPE) - an indicator of the sum of all repetitions. Thus, according to the results of pedagogical testing, the individual rank of dynamic performance of rural women is quite homogeneous (1 – 2 points). This indicates the low motor and functional readiness of such girls, girls and women of different ages for aerobic physical activity for various muscle groups of the body (the belt of the upper and lower extremities, torso) relative to the established norm for representatives of a healthy lifestyle of the modern community. Analysis of the statistical description of the CFU indicators of male rural residents shows the presence of insufficient homogeneity of the study population on this basis (coefficient of variation from 22.32 to 40.16%), Table 4.

Table 4. Descriptive statistics of CFE indicators in rural boys, young men and men (number of times)

Age, years	Valid N	Mean	Median	Percentile 25.00	Percentile 75.00	Std	Coefficient of variation	p	$IR_{\%}$, %	IR, point
6 – 9	180	84.08	81.50	71.00	110.00	27.57	32.79	0.00	-19.25	1
10 – 14	450	100.49	97.00	65.00	125.00	35.47	35.30	0.00	3.91	1
15 – 21	152	115.49	115.00	73.00	145.00	37.84	32.76	0.01	25.08	2
22 – 35	53	101.94	100.00	67.00	132.00	39.53	38.78	0.04	5.96	1
36 – 60	140	76.48	75.00	67.00	109.00	30.72	40.16	0.01	-29.97	1
61 – 75	42	73.73	75.00	75.00	94.00	16.46	22.32	0.01	-33.86	1
6 – 75	1017	84.08	81.50	71.00	110.00	27.57	32.79	0.00	-3.15	1

The individual rank of this indicator is represented in most age groups (and in the entire population as a whole) by negative values from -33.86 to -3.15% (1 point). Only ages 15 – 21 have an average value, where IR% = 25.08% (2 points).

Descriptive statistics of indicators HPR and PVRP of the male population indicate absolute and sufficient homogeneity of data among representatives of most age groups of the study sample (coefficient of variation from 11.50 to 20.17%), Table 5.

Table 5. Descriptive statistics of pulse response height indicators in rural boys, young men and men during physical activity and after five minutes of recovery (beats/min)

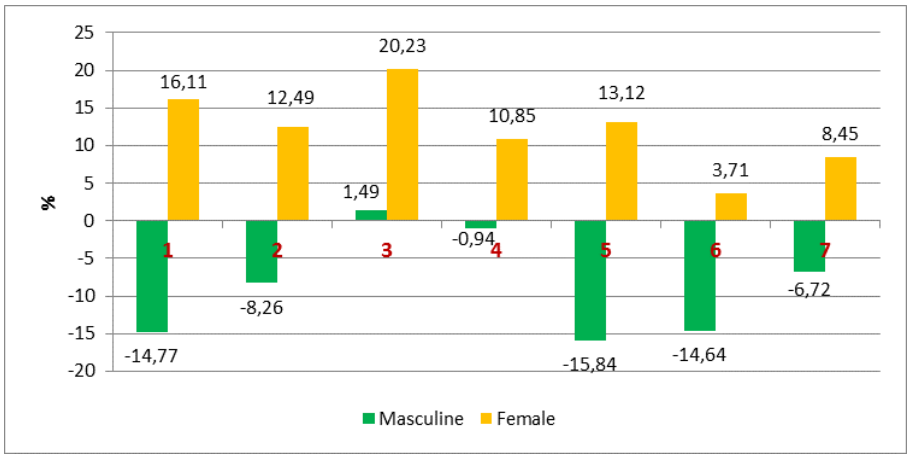
Age, years	Valid N	Mean	Median	Percentile 25.00	Percentile 75.00	Std	Coefficient of variation	p	IR%, %	IR, point
6 – 9	180	140.33	141.00	127.00	154.00	17.64	12.57	0.00	-10.29	1
10 – 14	450	144.95	145.00	136.00	164.00	23.04	15.89	0.00	-20.43	1
15 – 21	152	145.72	145.00	131.00	169.00	27.22	18.68	0.01	-22.11	1
22 – 35	53	139.21	140.00	131.00	154.00	28.08	20.17	0.03	-7.83	1
36 – 60	140	136.42	135.00	126.00	144.00	24.15	17.70	0.00	-1.71	1
61 – 75	42	133.55	135.00	126.00	142.00	15.36	11.50	0.01	4.59	1
6 – 75	1017	140.33	141.00	127.00	154.00	17.64	12.57	0.00	-10.29	1

At the same time, the individual rank according to the indicator HPR for the majority of the surveyed individuals corresponds to a low level from 22.43 to 4.59% (1 point). The assessment of the dynamic performance indicator of male representatives was 6.72%, which corresponds to one point, Table 6.

Table 6. Individual rank of dynamic performance of rural boys, young men and men

Indicators	Age, years						
	6 – 9	10 – 14	15 – 21	22 – 35	36 – 60	61 – 75	6 – 75
$IR_{\%\Sigma\ CCPE}$, %	-19.25	3.91	25.08	5.96	-29.97	-33.86	-3.15
$IR_{\%\ HPR\ and\ PVRP}$, %	-10.29	-20.43	-22.11	-7.83	-1.71	4.59	-10.29
$IR_{\%DP}$, %	-14.77	-8.26	1.49	-0.94	-15.84	-14.64	-6.72
IR, point	1	1	1	1	1	1	1

The lowest indicator of the individual rank of dynamic performance (IR% DP) is found at school, second working age and retirement age. This basically repeats a similar situation among the female half of the rural community. Thus, the individual rank of dynamic performance of the male population of the Republic of Belarus is absolutely homogeneous (1 point) and shows negative values, figure.



Note. 1 – age 6 – 9 years; 2 – age 10 – 14 years; 3 – age 15 – 21 years; 4 – age 22 – 35 years; 5 – age 36 – 55 (60) years; 6 – age 56 (61) – 75 years; 7 – age 6 – 75 years

Fig. Comprehensive pedagogical assessment of the dynamic performance of rural residents in Belarus

The data presented in the figure indicate extremely low dynamic aerobic performance of rural women and men in Belarus.

Discussion

Currently, to determine a person's physical performance (as a basic predictor of physical health), a variety of pedagogical tests and functional tests are used. The most popular among specialists in the field of mass physical culture are tests that are designed to assess the cardiovascular system under standard physical activity (Shved, & Levitska, 2018; Grassler et al., 2021; Bellenger & Buckley, 2021). These include the Ruffier, Dixon, and Martinet-Kushelevsky samples. Unlike more informative tests (bicycle ergometer test PWC-170, Harvard step test, etc.), they do not require additional (often expensive) equipment, as well as a sufficiently high level of physical fitness of the subjects, which is not always feasible during a mass examination. On the issue of testing,

the system of using the Cooper pedagogical test is separately highlighted. This test uses only a quantitative indicator of physical activity over a certain period of time (12, 8, 6, 4 minutes) without taking into account heart rate (Kolpakova, 2018).

The simplest and most accessible among the listed tests is the Ruffier test, which offers an assessment of the functional state (or physical performance of a person as a whole) using the five-stage index of the same name (Maltsev, & Vekshina, 2019). We have attempted an integrated approach to solving a number of issues related to the problem of ensuring the mass scale and accessibility of control exercises, as well as the informativeness and objectivity of indicators that allow us to assess a person's physical performance. The method we propose for determining physical performance involves independently counting and recording the heart rate at rest, after physical activity and after every minute for a five-minute recovery period. Physical activity of the most common types of motor actions is used as a trigger, reflecting the level of their readiness for everyday interaction with the surrounding biogeosociocenosis (push-ups, lifting the body and squats). An important requirement is the motor-active performance of the pedagogical test for three minutes with the test subject aiming to achieve the maximum result in the number of repetitions.

According to experts (physical education teachers at general education institutions in rural areas in the Republic of Belarus), the author's proposed method of pedagogical diagnostics of dynamic human performance is easy to use and comfortable for the subject. It is also easy to process the material, which makes it possible to objectively quantify the results of changes in the functional state in 6 to 75-years-old of rural population (Snezhitsky, 2023). The method for assessing a person's dynamic performance based on individual rank is original according to several criteria. Firstly, one control exercise combines three types of activities, maximally covering a large number of muscles of the musculoskeletal system. Secondly, the physical activity performed has an objective quantitative indicator, and is also both individual and maximum for each subject. This is due to the fact that it is performed at the highest possible pace and at the maximum heart rate (aiming for 170 beats). Thirdly, one pedagogical test contains two synergistic parameters of the external and internal manifestations of the functional systems of the human body to physical activity (physical work and reaction to it). Fourthly, the performance assessment is calculated using a proven formula, which allows you to determine the individual rank of a person on an objective centile scale (from 1% to 100%) relative to the norm (the arithmetic mean of the base population). All this makes it possible to massively cover the contingent of people being tested in any social or professional community.

As a result of our research on the external reactions of the body to repeated aerobic locomotion, an assessment was made of the functional state of the rural population of the Republic of Belarus aged from 6 years to 75 years. Low indicators of dynamic performance of the surveyed population were established, which did not exceed 1 point in most age groups, which confirms the experimental data we obtained earlier (Snezhitsky et al., 2022). These results are consistent with the conclusions of many researchers (Junger et al., 2019; Zhang et al., 2019; Kolokoltsev et al., 2021) about the low indicators of physical health of the population of many countries on the planet and the need to take urgent measures to improve their quality of life.

Conclusions

A method for assessing the dynamic performance of the human body in the age range from 6 to 75 years has been proposed and tested. The technique is based on the response of the cardiovascular system to the maximum control physical activity possible for each individual, based on natural everyday motor activity algorithms that involve a large number of muscles of the upper, lower extremities and torso. To assess dynamic performance, a complex physical exercise was used, which included performing three tests each lasting 1 minute. The test used was push-ups, sit-ups and squats. Among the functional indicators, we used the measurement of heart rate before and after performing a complex physical exercise for 15 seconds at different periods of heart rate recovery after performing the load. Calculations were carried out using the proposed formula for a complex indicator of heart rate, the height of the pulse reaction and the pulse value of the recovery period. The assessment of the individual rank of a person's dynamic performance was carried out according to the proposed formula, taking into account the values of the indicators of the individual rank of complex physical exercise (number of times) and the individual rank of the height of the pulse response to complex physical exercise and the pulse value of the recovery period (beats/min).

A low level of individual rank of dynamic performance was established among representatives of both genders of the rural community. It was found that the level of dynamic performance among female representatives of the Republic of Belarus was 8.45% (1 point or low level), among male representatives - 6.72% (1 point or low level). These data indicate that over the past decades, rural residents in Belarus have significantly decreased the functional capabilities of the cardiovascular and musculoskeletal systems. This can be explained by the insufficient use of the optimal level of regular aerobic physical activity by rural residents.

The proposed innovative methodology for pedagogical diagnostics of dynamic human performance is publicly available, quite informative and easy to implement, which makes it possible to recommend it for mass use in the field of physical education.

Conflicts of interest. The authors declare no conflict of interest

References:

Adams, J.A., Patel, S., Lopez, J.R., & Sackner, M.A. (2018). The effects of passive simulated jogging on shortterm heart rate variability in a heterogeneous group of human subjects. *J Sports Med*, *1*, 4340925, DOI:10.1155/2018/4340925

Aparecida Maria Catai, Carlos Marcelo Pastre, Moacir Fernades de Godoy, Ester da Silva, Anielle Christine de Medeiros Takahashi, & Luiz Carlos Marques Vanderlei (2020). Heart rate variability: are you using it properly? Standardisation checklist of procedures. *Braz J Phys Ther, 24(2),* 91-102. DOI:10.1016/j.bjpt.2019.02.006

Bellenger, C., Thomso, R., Davison, K., Robertson, E., & Buckley, J. (2021). The Impact of Functional Overreaching on Post-exercise Parasympathetic Reactivation in Runners. *Front Physiol, 11.* DOI:10.3389/fphys.2020.614765

Bocharin, I., Guryanov, M., Martusevich, A., Apoyan, S., Kolokoltsev, M., Melnichuk, A., Vorozheikin, A., & Romanova, E. (2022). Young men's body hemodynamics variability in different states of motor activity. *Journal of Physical Education and Sport*, *22(3*), 562-569. DOI: 10.7752/jpes.2022.03070.

Bocharin, I., Guryanov, M., Romanova, E., Suldin, P., Kolokoltsev, M., Bayankin, O., Lozovaya, M., Tyupa, P., Aganov, S., & Pronin, E. (2023). Physical development and functional state of the neuromuscular apparatus of students of different health groups. *Journal of physical education and sport*, *23(7),* 1583-1589. DOI:10.7752/jpes.2023.07194

Butakova, M., Gryaznikh, A., & Kiseleva, M. (2019). Vegetative support of functional reserves in the post-stress recovery period. Proceedings of the 4th International Conference on Innovations in Sports, Tourism and Instructional Science (ICISTIS 2019). *Advances in Health Sciences Research, 17*, 31-33

Christiani, M., Grosicki, G., & Flatt, A. (2021). Cardiac-autonomic and hemodynamic responses to a hypertonic, sugar-sweetened sports beverage in physically active men. *Appl Physiol Nutr Metab*, *24*, 1-7.

Dupuy, O., Douzi, W, Theurot, D., Bosque,t L., & Dugué, B. (2018). An Evidence-Based Approach for Choosing Post-exercise Recovery Techniques to Reduce Markers of Muscle Damage, Soreness, Fatigue, and Inflammation: A Systematic Review With Meta-Analysis. *Front Physiol, 9(403),* 403. DOI:10.3389/fphys.2018.00403

Grässler, B., Thielmann, B., Böckelmann, I., & Hökelmann, A. (2021). Effects of Different Training Interventions on Heart Rate Variability and Cardiovascular Health and Risk Factors in Young and Middle-Aged Adults: A Systematic Review. *Front Physiol, 12*, 657274. doi: 10.3389/fphys.2021.657274

Junger, J., Salonna, F., Bergier, J., Junger, A., Frömel, K., Ács, P., & Bergier, B. (2019). Physical activity and Body-Mass-Index relation in secondary-school students of the Visegrad region. *Journal of Physical Education and Sport*, *Vol 19* (Supplement issue 1), Art 35, 235 – 241. DOI:10.7752/jpes.2019.s1035

Kemerova, V. E., & Kerimova, T. Kh. (2020). Modern philosophical dictionary: dictionary.: Academic Project

Kolokoltsev, M., Ambartsumyan, R., Gryaznykh, A., Kraynik, V., Makeeva, V., Nonoyan, K., Romanova, E., Savchenkov, A., Mischenko, N., & Vrachinskaya, T. (2021). Physical activity amount influence over suboptimal health status. *Journal of Physical Education and Sport*, *21(1):* 381-387. DOI:10.7752/jpes.2021.05353

Kolpakova, E. M. (2018). Motor activity and its influence on human health. *Health, physical culture and sports, 8(1)*, 94-109. Available from http://hpcas.ru/article/view/3818

Koryahin, V., Blavt, O., Bakhmat, N., Guska, M., Ludovyk, T., Prozar, M., Bodnar, A., Kravets, S., & Bezgrebelnaya, E. (2018). Differentiated correction of attention abilities of students with chronic diseases during physical education. *Journal of Physical Education and Sport*, *18(4),* Art 343, 2278 – 2283. DOI:10.7752/jpes.2018.04343

Maltsev, D.N., & Vekshina, E.V. (2019). Diagnostic value of the Ruffier test. *Health, physical culture and sports*, *5 (16)*. Available from: https://cyberleninka.ru/article/n/diagnosticheskoe-znachenie-proby-rufie

Mischenko, N., Kolokoltsev, M., Romanova, E., Tsapov, E., Ustselemov, S., Tsaytler, E., Gryaznykh, A., Kuznetsova, E., Vorozheikin, A., & Purevdorj, D. (2020). Pilates program use for high school girls' additional physical education. *Journal of Physical Education and Sport, 20(6),* 3485-3490. DOI:10.7752/jpes.2020.06470

Sergio Jiménez Morgan, & José Arturo Molina Mora (2017). Effect of heart rate variability biofeedback on sport performance, a systematic review. *Psychophysiol. Biofeedback*, *42(3),* 235-245. DOI: 10.1007/S10484-017

Shved, M.I., & Levitska, L.V. (2018). Modern technologies of rehabilitation treatment of patients with acute coronary syndrome. Kyiv. Medknyha Publishing House.

Snezhitsky, P., Romanova ,E., Kolokoltsev, M., Vorozheikin, A., Smirnov, S., Bolotin, A., Tarasov, A., Aganov, S., & Suldin, P. (2022). Complex pedagogical diagnostics of personal motor activity. *Journal of Physical Education and Sport*, *Vol. 22* (issue 11), Art 341, pp. 2681- 2687. DOI:10.7752/jpes.2022.11341

Snezhitsky, P.V. (2023). Problems of pedagogical diagnostics of the motor culture of the individual in a rural community. *World of Sports, 90(1),* 76-83

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