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Monitoring the state of health of first-year female students of National University of Pharmacy in the 2018-2021 academic years

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Abstract

The purpose of this research is to compare and determine the level of health of first-year female students of NUPh in the 2018-2021 academic years.

Material & Methods: the research involved 528 first-year female students of National University of Pharmacy (the year of entry 2018 (n=311); the year of entry 2019 (n=107); the year of entry 2020 (n=60); the year of entry 2021 (n=50)). Anthropometric parameters (body weight, standing height, hand muscle strength), physiological parameters (vital capacity of the lungs (VCL), heart rate (HR)) were determined during the examination. Functional breath-holding tests (the Stange and Hench tests) were performed, the level of physical health was determined by the method of Pyrohova, O.A., the express assessment of the level of somatic health was determined by the method of Apanasenko, H.A., and the method of assessing physical work capacity using the Ruffier test was performed. Descriptive statistics were used for the statistical analysis of the data. The comparison of average values of variable indicators was carried out using parametric methods (Student's t-test) with the normal distribution of these signs expressed in the interval scale. All calculations were performed in StatSoft Statistica 8.1 for Windows.

Results: the data obtained in the course of the research allow us to state that the indicators of the Ruffier index are at "satisfactory" (14,1±0,3) and "average" levels (7,5±1,1). The somatic health indicator was also at the "below average" level in 2018 (4 points), it was at the "average" level (7 points) in 2019, and in 2020 and 2021, this indicator was already at the "above average" level (14 and 13 points, respectively). The level of physical health was also at the "average" level in 2018 (0,560), and in 2021 it was at the "above average" level (0,697).

Conclusions: the conducted research showed that the somatic health and physical state of first-year female students of NUPh were improving from year to year (starting from 2018), which is reflected in the health level indicator according to the method of Pyrohova, O.A. and Apanasenko, H.A., the Ruffier index, and the results of the Stange and Hench tests. The Romberg test was within the normal range. The obtained results create broad prospects for their involvement in physical culture and sports activities.

Key words: health, students, Stange test, Hench test, Romberg test, Ruffier test.

Анотація

Моніторинг стану здоров'я першокурсниць НФаУ наборів 2018-2021 навчальних років. Мета: порівняти та визначити рівень стану здоров'я студенток першокурсниць НФаУ наборів з 2018 по 2021 рік. **Матеріал і методи:** у дослідження прийняли участь

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528 студенток першокурсниць Національного фармацевтичного університету (2018 рік вступу (n=311); 2019 рік вступу (n=107); 2020 рік вступу (n=60); 2021 рік вступу (n=50)). У ході обстеження визначалися антропометричні показники (вага тіла, зріст стоячи, сила м'язів кисті), фізіологічні показники (життєва ємність легень (ЖЄЛ), частота серцевих скорочень (ЧСС). Були проведені функціональні проби на затримку дихання (проби Штанге та Генче), визначено рівень фізичного стану здоров'я за методикою О. А. Пирогової, експрес оцінка рівня соматичного здоров'я за методикою Г. А. Апанасенко та проведена методика оцінки фізичної працездатності з використанням проби Руф'є. Для статистичного аналізу даних використовували дескриптивну статистику. Порівняння середніх значень змінних показників здійснювали за допомогою параметричних методів (t-критерія Стьюдента) за нормального розподілу даних ознак, що виражені в інтервальній шкалі. Всі розрахунки виконували у програмі StatSoft Statistica 8.1 for Windows. **Результати:** отримані в ході дослідження дані дозволяють констатувати, що показники індексу Руф'є знаходяться на «задовільному» (14,1±0,3) та «середньому рівні» (7,5±1,1). Показник соматичного здоров'я також знаходився у 2018 році на «нижче середньому рівні» (4 бали), у наборі 2019 році – «середній рівень» (7 балів), а у 2020 та 2021 році цей показник знаходиться вже на «вище середньому рівні» (14 та 13 балів, відповідно). Рівень фізичного стану здоров'я так само у 2018 році знаходився на «середньому рівні» (0,560), а у 2021 році на «вище середньому рівні» (0,697). **Висновки:** проведені дослідження показали, що у студенток першокурсниць НФаУ від набору до набору (починаючи з 2018 року) соматичне здоров'я та фізичний стан покращуються, що відобразилось у показнику рівня здоров'я за методикою О. А. Пирогової та Г. А. Апанасенко, індексом Руф'є та за результатами проб Штанге та Генче. Проба Ромберга знаходились в межах норми. Отримані результати створюють широкі перспективи для їх залучення до занять фізичною культурою та до спортивної діяльності.

Ключові слова: здоров'я, студенти, проба Штанге, проба Генче, проба Ромберга, проба Руф'є.

Introduction

In recent years, the problem of preserving and promoting the health of student youth has become relevant (Biletska et al., 2019; Sutula et al., 2016). This is due to the fact that there is a steady trend towards an increase in the number of students with health problems (Biletskaet et al., 2019; Sutula et al., 2016; World Medical Association, 2013). For example, up to 90% of students have serious health problems (Bezukh & Chystiakov, 2017, Prysiazhniuk & Krasnov, 2019), the somatic health indicator is low and below average in 70% of students (Cameron et al., 2015; Hersymenko & Hurelych, 2019; Tamozhanska, & Nevelika, 2020; Tovkun & Tsarova 2017), 52.6% have morphological and functional deviations of various nature (Boiarska & Nykytiuk, 2022; Hurman & Kobrynska, 2022), and 36-40% have chronic non-communicable diseases (Hurman & Kobrynska, 2022). The analysis of specialized literature also shows that the number of students classified as medical students is increasing (Cameron et al., 2015; Sukhenko, 2019). The above statistics indicate the need to find out the reasons for the deterioration of the health of female students during their studies at different universities.

The purpose is to compare and determine the level of health of first-year female students of NUPh in the 2018-2021 academic years.

Material and methods of research

Participants

The research involved 528 first-year female students of National University of Pharmacy (the year of entry 2018 (n=311); the year of entry 2019 (n=107); the year of entry 2020 (n=60); the year of entry 2021 (n=50)).

The participants signed an informed consent form to participate in the research.

Methods

During the examination, anthropometric parameters were determined: body weight (m, kg), standing height (cm), hand muscle strength (kg); physiological parameters (vital capacity of the lungs (VCL, (ml), measured by a dry spirometer in a standing position), and heart rate (HR, bpm) were performed according to the standard method. Blood pressure was measured with a spring sphygmomanometer after a 5-minute rest. To measure blood pressure, the patient was seated with the back supported, legs touching the floor but not crossed.

The methodology for assessing the exercise tolerance using the Ruffier test (IP) was performed, calculated using the formula IP = (4·(PS1+PS2+PS3)–200)/10, where PS1, PS2, and PS3 are pulse rates. Methodology of the Ruffier test (IP): after a 5-minute in rest sitting position, count the pulse (palpation) for 15 seconds (P1), then perform 30 sit-ups within 45 seconds. Immediately after that, count the pulse for the first 15 seconds (P2) and the last 15 seconds (P3) of the first minute of the recovery period.

The express method of forecasting the level of physical state by the method of Pyrohova, O.A. was calculated by the formula:

$$X=(700-3\cdot HR_{in\ rest}-2,5\cdot BP_{aver.}-2,7\cdot age+0,28\cdot weight_{body})/(350-2,6\cdot age+0,21\cdot height),$$

where $HR_{in\ rest}$ is the resting heart rate, bpm^{-1}; $BP_{aver.}$ is mean arterial pressure (BP, mmHg), calculated by the formula: $BP_{aver.}$ = diastolic blood pres-

sure + 1/3 × pulse blood pressure; pulse blood pressure (mmHg) = systolic blood pressure (SBP, mmHg) – diastolic blood pressure (DBP, mmHg).

During the examination, the body mass index was determined: weight (kg)/height (m) (BMI, kg/m^2); vital index, was determined: VCL (ml)/ weight(kg) (I, ml/kg); strength index was calculated: hand dynamometry x 100% / body weight) (%); Robinson index was calculated by the formula: $HR_{in\ rest}$ (bpm) x SBP (mmHg) / 100 (units) (Romanchuk, 2010; Tamozhanska, 2019).

The express assessment of somatic health according to the method of Apanasenko, H.A. (points) is recorded on the basis of anthropometric indicators, namely the calculation of the following indicators: weight index, vital index, Robinson index, strength index, and Ruffier test. Functional breath holding tests were performed: Stange (s) (breath holding during inhalation) and Hench (s) (breath holding during exhalation), performed in a sitting position. The Romberg test (s) for maintaining balance was performed (performance: the starting position is standing on one leg, the other leg is bent forward in the knee and touches the knee joint of the supporting leg with the sole of the foot, eyes are closed, and arms are stretched horizontally forward, with fingers spread, and the time for maintaining balance is checked). The results obtained during the examination were compared with the tabulated data, on the basis of which a certain number of points was awarded for the actual value of each of the parameters.

Procedure

The research was conducted at National University of Pharmacy on the basis of the Department of Physical Rehabilitation and Health. The research involved first-year female students of the 2018-2021 academic years. All tests were conducted by teachers from the Department of Physical Rehabilitation and Health at the beginning and end of the academic year.

The research was performed in accordance with ethical standards of the Declaration of Helsinki.

Statistical analysis

The descriptive statistics were used for statistical analysis of the data. During the statistical processing of the research results, the normality of the distribution of each sample was first checked using the Kolmogorov-Smirnov test. The comparison of the mean values of variables was carried out using parametric methods (Student's t-test) in the case of a normal distribution of data on the features expressed in the interval scale. Each sample population is distributed according to the normal law. We determined the arithmetic mean (X), standard deviation (±SD), and significance value (p). The level of significance for the results was expressed using the p-value, with $p<0,05$ being statistically significant. All calculations were performed in StatSoft Statistica 8.1 for Windows.

Results of the study

The result of the research indicates that the average group indicators of body weight and height of first-year female students in the 2018-2021 academic years don't differ statistically (m_{2018}=56,2±8,01; m_{2019}=56,5±8,56; m_{2020}=53,9±4,3; m_{2021}=54,9±6,6 and standing height, respectively, 165,8±6,1; 166,5±5,8; 163,4±4,9; 165±5,6). The average group indicators of body weight and standing height in the selected groups (first-year female students of the 2018-2019 academic years) are statistically insignificant, because t_p=0,3 and t_{cr}=1,97, that is, $t_p<t_{cr}$ (body weight), and t_p=1,4 and t_{cr}=1,97, that is, $t_p<t_{cr}$ (standing height). The average group indicators of body weight between the 2018-2020 academic year and 2018-2021 academic year are statistically significant, because t_p=3,8 and t_p=7,2, and t_{cr}=1,97, that is, $t_p>t_{cr}$. A similar conclusion is observed in the average group indicators of body height (2018-2020 academic years, because t_p=4 is greater than t_{cr}=1,97) (Table 1).

The data also indicate that the average group indicators of hand strength and vital capacity of the lungs improve with each set in first-year female students (from 2018 to 2021). Thus, the indicator of hand strength in the 2018 academic year was 23,4±6,2; 2019=24,7±4,7; 2020=27,9±3,0; 2021=26,1±5,1 (Table 1). The average group values of vital capacity of lungs were distributed as follows: 2018=2280±1378,3; 2019=3014±883,4; 2020=2810±523,9; 2021=2500±582,7 (Table 1). The obtained results indicate that the difference between the average group values of the index of bone strength in the selected groups is statistically significant, because $t_p>t_{cr}$ (2018-2019 academic years: $t_p=2,3>t_{cr}=1,97$; 2018-2020 academic years: $t_p=6,8>t_{cr}=1,97$; 2018-2021 academic years: $t_p=3,7>t_{cr}=1,97$). A similar conclusion follows from the comparison of the average group indicators of VCL (2018-2019: $t_p=8,9>t_{cr}=1,97$; 2018-2020: $t_p=10>t_{cr}=1,97$; 2018-2021: $t_p=2,25>t_{cr}=1,97$) (Table 1).

The express assessment of the level of somatic health according to the methodology of Apanasenko, H.A. (Tamozhanska, 2019) showed that the average group indicator of the level of somatic health of female students who studied in the first year of NUPh in 2018 was below average (4 points), average in the year of entry 2019, and already above average in 2020 and 2021 (14 and 13 points, respectively).

The statistical analysis of the data showed that the first-year female students of the year of entry 2018 have an average level (0,560±0,02) of physical health according to the method of Pyrohova, O.Y. (Tamozhanska, 2019).

The level of physical health of the first-year female students of the year of entry 2019 was also at the average level (0,559±0,03), this indicator was 0,684±0,07 in the first-year female students of the

Table 1. Indicators of physical development in first-year female students in the 2018-2021 academic years

Indicator		Body weight, kg	Standing height, cm	Hand muscle strength, kg	VCL (ml)	P
The year of entry 2018 (P1) (n=311)	$\bar{X}_1$±SD	56,2±8,01	165,8±6,1	23,4±6,2	2280±1378,3	<0,05
The year of entry 2019 (P2) (n=107)	$\bar{X}_2$±SD	56,5±8,56	166,5±5,8	24,7±4,7	3014±883,4	
(P1-P2) (n=418)	$T_{p.}$	0,3	1,4	2,3	6,3	<0,05
	T_{cr}	1,97	1,97	1,97	1,97	
Result of comparison (t_p with t_{cr}) / Difference between average indicators		$t_p<t_{cr}$ insignificant	$t_p<t_{cr}$ insignificant	$t_p>t_{cr}$ significant	$t_p>t_{cr}$ significant	
The year of entry 2020 (P3) (n=60)	$\bar{X}_3$±SD	53,9±4,3	163,4±4,9	27,9±3,0	2810±523,9	
(P1-P3) (n=371)	$T_{p.}$	3,8	4	6,8	5,1	<0,05
	T_{cr}	1,97	1,97	1,97	1,97	
Result of comparison (t_p with t_{cr}) / Difference between average indicators		$t_p>t_{cr}$ significant	$t_p>t_{cr}$ significant	$t_p>t_{cr}$ significant	$t_p>t_{cr}$ significant	
The year of entry 2021 (P4) (n=50)	$\bar{X}_4$±SD	54,9±6,6	165±5,6	26,1±5,1	2500±582,7	
(P1-P3) (n=361)	$T_{p.}$	7,2	0,8	3,7	1,94	
	T_{cr}	1,97	1,97	1,97	1,97	<0,05
Result of comparison (t_p with t_{cr}) / Difference between average indicators		$t_p>t_{cr}$ significant	$t_p<t_{cr}$ insignificant	$t_p>t_{cr}$ significant	$t_p<t_{cr}$ insignificant	

Table 2. Express assessment of the level of somatic health according to the method of Apanasenko, H.A. for first-year female students of the 2018-2021 academic years

Indicators	the year of entry 2018 (n=311)	the year of entry 2019 (n=107)	the year of entry 2020 (n=60)	the year of entry 2021 (n=50)	P
	$\bar{X}_1$±SD (s)	$\bar{X}_2$±SD (s)	$\bar{X}_3$ ±SD (s)	$\bar{X}_4$ ±SD (s)	
Body weight index (kg/m²)	20,6±0,16 (0 points)	20,5±0,36 (0 points)	20,3±0,2 (0 points)	20,2±0,23 (0 points)	<0,05
Vital index (ml/kg)	42,7±0,65 (0 points)	60,2±0,9 (3 points)	63,1±1,17 (3 points)	63,7±1,17 (3 points)	<0,05
Strength index (%)	41,6±0,55 (0 points)	43,7±0,6 (0 points)	51,7±1,34 (1 point)	47,5±1,45 (0 points)	<0,05
Robinson's index (relative units)	98,3±0,5 (–1 point)	99,4±0,56 (–1 point)	75,4±1,7 (3 points)	81,9±2,8 (3 points)	<0,05
Heart rate recovery time after 30 squats in 45 s	1,13 min. ±0,02 (5 points)	1,29 min. ±0,03 (5 points)	45 s. ±0,02 (7 points)	30 s. ±0,01 (7 points)	<0,05
Overall health assessment (points)	4 points	7 points	14 points	13 points	<0,05

year of entry 2020, which is above average; and in the year of entry 2021, it was 0,697±0,08, which is also above average. Student's t-test showed that the difference between the group averages in the selected groups isn't statistically significant, because $t_p<t_{cr}$ (2018-2019: $t_p=0,03<t_{cr}=1,97$; 2018-2020: $t_p=1,2<t_{cr}=1,97$; 2018-2021: $t_p=1,3<t_{cr}=1,97$).

Indicators of the functional state of the first-year female students of the entry years 2018-2021 showed the following: the results of the Stange test in girls are normal and range from 37,9 to 42,47 (Table 3). However, comparing the data obtained with the table data, we see that the assessment of the Stange test in 2018, 2019, and 2020 corresponds to the "satisfactory level", and in 2021 it is already at the "good" level. The average group indicators of the Stange test in the selected groups are statistically insignificant, as $t_p<t_{cr}$. A similar situation exists with the results of the Hench test (24,8-29,1). In 2018, 2019, and 2020, the Hench test assessment was at the "satisfactory level", and

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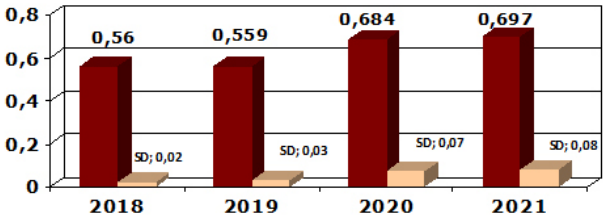

Fig. 1. The level of physical health of female students according to the method of O.Y. Pyrohova

in 2021 it improved and corresponded to the "good" level. The average group indicators of the Hench test are also statistically insignificant, because $t_p<t_{cr}$ 2018-2019: $t_p=0,5<t_{cr}=1,97$; 2018-2020: $t_p=1,4<t_{cr}=1,97$; 2018-2021: $t_p=0,8<t_{cr}=1,97$ (Table 4).

The results of the research indicate that the average group indicators of the Romberg test in all years are normal and statistically insignificant, $t_p<t_{cr}$. Thus, in the 2018 academic year = 18,7±0,93; the 2019 academic year = 25,35±2,4; the 2020 academic year = 27,03±2,94; the 2021 academic year = 22,4±3,69 (Table 4).

The situation is similar with the Ruffier index. Thus, in 2018, it was 14,1±0,3 for the first-year female students, which indicates a below average (satisfactory) level of health, and the same situation was observed in the entry year 2019 (13,15±1,4). Starting in 2020, the value of this index is 11,4±1,36, although this is also below average (satisfactory). In the entry year 2021, the Ruffier index is 7,5±1,1, which indicates the average level of their health (Table 3). A comparison of the average values of the Ruffier index showed that 2018-2019, $t_p=0,5<t_{cr}=1,97$ (insignificant); 2018-2020: $t_p=5,2>t_{cr}=1,97$ (significant); 2018-2021: $t_p=4,7>t_{cr}=1,97$ (significant) (Table 4).

Discussion

The analysis of specialized literature showed that the state of student youth in general, without division into genders (boys and girls) and after years of study at universities, has recently been unsatisfactory. More than 50% of students studying at higher education institutions don't meet the average level of the state standard of physical fitness.

Table 3. Indicators of the functional state of the body of first-year female students in the 2018-2021 academic years

Indicators	the year of entry 2018 (n=311)		the year of entry 2019 (n=107)		the year of entry 2020 (n=60)		the year of entry 2021 (n=50)		P
	$\bar{X}_1$ (s)	SD	$\bar{X}_1$ (s)	SD	$\bar{X}_1$ (s)	SD	$\bar{X}_1$ (s)	SD	
Stange test, s	37,9	0,85	42,2	1,4	39,6	1,46	42,47	1,9	<0,05
Hench test, s	27,5	0,7	28,3	1,06	24,8	1,14	29,1	1,2	<0,05
Romberg test, s	18,7	0,93	25,35	2,4	27,03	2,94	22,4	3,69	<0,05
HR, bpm	88	0,2	87	0,32	66	0,28	73	0,56	<0,05
Ruffier index	14,1	0,3	13,15	1,37	11,4	1,36	7,49	1,12	<0,05

Table 4. Reliability of the difference in functional state indicators by (Student's t-test)

Indicators	(P1-P2) (n=418)		Result of comparison t_p with t_{cr}	Difference between average indicators	(P1-P3) (n=371)		Result of comparison t_p with t_{cr}	Difference between average indicators	(P1-P3) (n=361)		Result of comparison t_p with t_{cr}	Difference between average indicators
	$T_{p.}$	$T_{cr.}$			$T_{p.}$	$T_{cr.}$			$T_{p.}$	$T_{cr.}$		
Stange test, s	1,56	1,97	$t_p<t_{cr}$	insignificant	0,6	1,97	$t_p<t_{cr}$	insignificant	1,04	1,97	$t_p<t_{cr}$	insignificant
Hench test, s	0,5	1,97	$t_p<t_{cr}$		1,4	1,97	$t_p<t_{cr}$		0,8	1,97	$t_p<t_{cr}$	
Romberg test, s	0,98	1,97	$t_p<t_{cr}$		0,86	1,97	$t_p<t_{cr}$		0,42	1,97	$t_p<t_{cr}$	
HR, bpm	2,5	1,97	$t_p>t_{cr}$	significant	136	1,97	$t_p>t_{cr}$	significant	36,4	1,97	$t_p>t_{cr}$	significant
Ruffier index	0,5	1,97	$t_p<t_{cr}$	insignificant	5,2	1,97	$t_p>t_{cr}$		4,7	1,97	$t_p>t_{cr}$	

In scientific research (Bezukh & Chystiakov, 2017; Dillon et al., 2020; Hersymenko, & Hurelych, 2019; Maksymova, 2017; Biletska et al., 2019; Gerasymenko & Gurelych, 2019) stated that in general, all students have an average, below average, or low level of somatic health. The results of the research of a number of authors show that a significant number of indicators of the functional state of students are mainly at an unsatisfactory level (Bezukh & Chystiakov, 2017; Nevelika & Sutula, 2022; Prysiazhniuk & Krasnov, 2019; Tamozhanska et al., 2018; Sorokolit & Kuhar, 2019; Sukhenko, 2019). Maksymova (2017), Biletska et al. (2019), Gerasymenko & Gurelych (2019)

The analysis of specialized literature also showed that over the past 20 years, the level of physical fitness and health of student youth in general (without dividing them into boys and girls and periods of their study at universities) has deteriorated significantly (Hurman & Kobrynska, 2022; Prysiazhniuk & Krasnov, 2019; Sukhanova & Nepsha, 2017). Many works are devoted to the analysis of the physical level of health, the somatic level, and functional indicators that indicate their deterioration during the period of study at universities (Hersymenko & Hurelych, 2019; Rusyn & Dutkevych-Ivanska, 2022; Tovkun & Tsarova, 2017).

Scientists consider the problems of monitoring the physical health of students and their involvement in physical exercises in different ways. Nowadays, a lot of different approaches have been substantiated, and the effectiveness of various types of physical exercises aimed at improving their health (Pilates, Taekwondo, various fitness programs, etc.) has been proven (Kashuba et al., 2015; More & Phillips, 2019; Sutula et al., 2021; Sukhenko, 2019). A number of studies have revealed the motivation of young people to maintain their health and the vital need for regular exercise (Brodersen et al., 2023; Sutula et al., 2016; Shepitko et al., 2020; Sukhanova & Nepsha, 2017).

The above results of scientific research indicate the need to monitor somatic health, physical health, and functional health at the beginning of their studies at universities in order to further understand and identify the causes of deterioration in their health, as noted by the above-mentioned scientists.

After analyzing the specialized literature, we saw that the health status of students is deteriorating, but in our study, we faced a contradiction. Our earlier study (2018-2019 academic year) also showed an unsatisfactory state of student youth, but when conducting repeated studies in 2020-2021, we saw a slight tendency to improve their health status (Nevelika & Sutula, 2022; Tamozhanska, & Nevelika, 2020). All this may indicate that today's general secondary education institutions have taken the right direction to improve the health of pupils through their conscious attitude toward physical exercise.

The prospect of research remains to assess the level of pupil health in general secondary education institutions.

Conclusion

1. The analysis of the results of the research shows that the level of health of first-year female students in the 2018 academic year was at the "satisfactory level", and that of female students in the 2021 academic year is at the "average level".

2. The results of the express assessment of the level of somatic health of female students in the 2018-2021 academic year indicate improvement. Thus, in 2018, it was "below average" (4 points), but in 2021, it was "above average" (13 points). A similar situation occurred with the express method of predicting the level of physical health according to the method of Pyrohova, O.Y.. The first-year female students of the 2018 academic year have an "average level" (0,560) of physical health, while in the 2021 academic year it was 0,697, "above average".

3. The generalized results of the research indicate that the average group values of the Stange test in the selected groups are statistically insignificant, as $t_p<t_{cr}$. and range from 37,9 to 42,47. The situation is similar with the group averages of the Hench test. They range from 24,8-29,1 and are statistically insignificant because $t_p<t_{cr}$. The results of the Romberg test are also statistically insignificant.

4. Thus, today we observe a tendency to improve the physical state of first-year female students from the 2018 academic year (below average (satisfactory) health level = 14,1±0,3) to the 2021 academic year (average level = 7,5±1,1). This creates broad prospects for their involvement in physical culture and sports activities.

Prospects for further research include comparing the level of health of female students throughout their studies at university.

Author's contribution

Conceptualization, A.N. and O.S.; methodology, A.N.; software, O.S.; check, A.N. and L.K; formal analysis, O.S.; investigation, L.K.; resources, O.S.; data curation, V.S.; writing – rough preparation, A.N.; writing – review and editing, A.N; visualization, O.S.; supervision, A.N.; project administration, L.K. All authors have read and agreed with the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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References

Bezukh, K.E., & Chystiakov, V.V. (2017). Analysis of the functional state of students of a pedagogical university. *Bezopasnost zdorovia cheloveka*, 3, 6-13. http://bit.ly/3ZhoPsX

Biletska, V., Polianychko, O., Lytvynova, K., Biriuchynska, S., & Danylo, L. (2019). Assessment of the correspondence of the subjective self-assessment of the level of health to the actual level of physical health of examined young men and girls. *Sportyvna nauka ta zdorov'ia liudyny*, 2, 2-9. https://doi.org/10.28925/2664-2069.2019.2.1

Boiarska, Z.O., & Nykytiuk, E.O. (2022). Monitoring the state of health of student youth under distance learning conditions. *Innovations and prospects of world science* [Conference]. Perfect Publishing. Vancouver, Canada. http://bit.ly/3lNQrIj

Brodersen, K., Hammami, N., & Katapally, T.R. (2023). Is excessive smartphone use associated with weight status and self-rated health among youth? A smart platform study. *BMC Public Health,* 23, 234. https://doi.org/10.1186/s12889-023-15037-8

Cameron, D., Epton, T., Norman, P., Sheeran, P., Harris, P.R., Webb, T.L., Julious, S.A., Brennan, A., Thomas, C., Petroczi, A., Naughton, D., & Shah, I. (2015). A theory-based online health behaviour intervention for new university students (U@Uni:LifeGuide): results from a repeat randomized controlled trial. *Trials*, 16, 555. https://doi.org/10.1186/s13063-015-1092-4

Dillon, K., Rollo, S., & Prapavessis, H. (2020). A combined health action process approach and mHealth intervention to reduce sedentary behaviour in university students – a randomized controlled trial. *Psychology & Health*, 37(6), 692-711. https://doi.org/10.1080/08870446.2021.1900574

Hersymenko, S.Yu., & Hurelych, M.S. (2019). Determining the level of somatic health of 1st-year female students of Ivan Franko Ivan Franko State Pedagogical University. *Aktualni problemy fizychnoho vykhovannia riznykh verstv naselennia.* 48-52. http://bit.ly/3z8t3IL

Hurman, L.D., & Kobrynska, A.R. (2022). Results of monitoring students' physical health. *Aktualni problemy rozvytku osvity v sferi turyzmu, fizychnoi kultury ta sportu* [Conference]. Khmelnytskyi, Ukraine. https://bit.ly/40G7JWR

Kashuba, V.A., Futornii, S.M., & Dudko M.V. (2015). On the issue of using innovative technologies for the formation of a healthy lifestyle of students in the process of physical education. *Naukovyi chasopys Nats. ped. un-tu im. M. P. Drahomanova,* 8(63), 28-32. http://enpuir.npu.edu.ua/handle/123456789/11338

Kimberly, R., More, L., & Phillips, A. (2019). The influence of body dissatisfaction on cardiovascular and strength-based physical activity by gender: a self-determination theory approach. *Psychology & Health*, 34(12), 1437-1450. https://doi.org/10.1080/08870446.2019.1614587

Maksymova, K.V. (2017). Monitoring of the state of somatic health of female students of the 1st year of higher educational institutions in the city of Kharkiv. *Mizhnarodnyi naukovyi zhurnal «Internauka»*, (29), 30-34. https://www.inter-nauka.com/ua/issues/2017/7/2480

Nevelika, A.V., & Sutula, O.V. (2022). The state of the biogeometric profile of the posture of the second-year students of the NFaU. *Suchasni poglyadi molodi na fizichnu kulturu, sport ta zdorov'ya lyudini* [Conference]. HDAFK, Harkiv, Ukraine, 121-123.

Prysiazhniuk, S.I., & Krasnov, V.P. (2019). The health of student youth and the path of its formation in the education system. *Naukovo-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport),* 3K(110)., 475-480. http://enpuir.npu.edu.ua/handle/123456789/26910

Romanchuk, O. (2010). Medical and pedagogical control in health-improving physical culture. Odesa.

Rusyn, L.P., & Dutkevych-Ivanska, Yu.V. (2022). Analysis of the physical development of university students based on the results of functional tests and movement tests. *Materialy 76-i pidsumkovoi naukovoi konferentsii profesorsko vykladatskoho skladu DVNZ «Uzhhorodskyi natsionalnyi universytet»* [Conference]. Uzhhorod, Ukraine.

Shepitko, V.I., Boruta, N.V., & Stetsuk, Ye.V. (2020). Motivation of young people to a healthy lifestyle in modern conditions. *Integration of scientific bases into practice* [Conference] Stockholm, Sweden, 335-337. https://doi.org/10.46299/ISG.2020.IV.

Sorokolit, N.S., & Kuhar, M.M. (2019). Health monitoring of students of the 1st-1st courses. *Naukovo-pedahohichni problemy fizychnoi kultury (fizychna kultura i sport)*, 3K(110), 533-538. http://enpuir.npu.edu.ua/handle/123456789/26978

Sukhanova, H.P., & Nepsha, O.V. (2017). Health monitoring of students of higher educational institutions assigned to special medical groups. *Stratehichne upravlinnia rozvytkom fizychnoi kultury i sportu.* 284-288. https://www.academia.edu/35507257/

Sukhenko, I. (2019). Changes in indicators of the physical condition of students under the influence of activities in sports sections. *Slobozhanskyi naukovo-sportyvnyi visnyk,* 2(70), 91-96. https://doi.org/10.15391/snsv.2019-2.016.

Sutula, O., Nevelyka, A., & Chucha, Yu. (2021). Badminton as one of the means of health and recreational activities of students. *Slobozhanskyi naukovo-sportyvnyi visnyk,* 6(86), 45-49. https://doi.org/10.15391/snsv.2021-6.007

Sutula, V.O., Lutsenko, L.S., Bulhakov, O.I., Deineko, A.Kh., Sutula, A.V., & Shutieiev, V.V. (2016). Concerning rather modern organizational innovations in the system of physical education of student youth. *Slobozhanskyi naukovo-sportyvnyi visnyk*, 1, 99-106. https://doi.org/10.15391/snsv.2016-1

Tamozhanska, G.V., & Nevelika, A.V. (2020). Comparative analysis of the state of health of students and the 2018 and 2019 course of study of the National Pharmaceutical University. *Suchasni tendenciyi spryamovani na zberezhennya zdorov'ya lyudini*, 1, 126-128. https://bit.ly/3JIg6dD

Tamozhanska, H., Nevelyka, A., Zelenenko, N., & Kobzar, S. (2018). Comparative analysis of indicators of physical development and level of health of female students of the first and second courses. *Visnyk Prykarpatskoho universytetu: seriia: Fizychna kultura*, 30, 100-106. https://doi.org/10.15330/fcult.30.100-106

Tamozhanska, H.V. (2019). *Methodological bases of quantitative assessment of the level of health, physical condition and risk of disease of students of 1-2 years of study*. NFaU.

Tovkun, L.P., & Tsarova, M.P. (2017). Assessment of the level of physical health of students of Pereyaslav-Khmelnytskyi State Pedagogical University named after Hryhoriy Skovoroda. *Molodyi vchenyi*, 9.1(49.1), 167-170. http://molodyvcheny.in.ua/files/journal/2017/9.1_49.1_2017.pdf

World Medical Association (2013), Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects. *JAMA*., 310(20), 2191-2194. https://doi.org/10.1001/jama.2013.281053