

Changes in physical activity indicators of Ukrainian students in the conditions of distance education

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Abstract

Purpose: purpose of the work is to determine the changes in physical activity indicators of Ukrainian students in the conditions of distance education caused by the quarantine restrictions and the conditions of the legal regime of martial law.

Material & Methods: the study, which lasted from 2020 to 2023, involved 1528 higher education students from different regions of Ukraine. The International Physical Activity Questionnaire (IPAQ) was used to assess physical activity. The results were subjected to statistical analysis.

Results: the results of the study of PA indicators in students showed that on average they had a normal PA score, which was 26.0 (22.0; 32.0) points for males, and 24.0 (19.0; 30.0) points for females. It was proved that, compared to female students, the PA score of male students was statistically significantly higher ($U=226269.5$; $Z=7.329$; $p<0.05$). The study of the dynamics of PA indicators demonstrated that while the PA score of higher education students, regardless of gender status, decreased from the beginning of quarantine restrictions ($p<0.05$), it did not differ statistically from the pre-quarantine level ($p>0.05$) in 2021. Nevertheless, with the outbreak of hostilities in the Ukraine, the PA score has decreased and continues to decline. There was an unprecedented increase in the percentage of students with low PA, which reached 43.1% and 60.1% among male and female students, respectively, in 2023.

Conclusions: the analysis of the dynamics of PA in higher education students for the period from 2019 to 2023 revealed a decrease in the PA score during the distance learning period, regardless of gender status. The only exception was 2021, which can be explained by the adaptation of students to distance learning. Instead, the armed conflict in the country led to a sharp decline in the PA score and a statistically significant ($p<0.05$) increase in the proportion of students with low physical activity. Moreover, this trend continued in 2023. The findings of the study made possible to assess the extent of the negative impact of distance learning under quarantine restrictions and the legal regime of martial law on the PA in higher education students.

Key words: higher education students, physical activity, distance education, female students, male students.

Анотація

Зміни показників фізичної активності українських студентів в умовах дистанційної освіти.

Мета: визначити зміни показників рухової активності (РА) студентів України в умовах дистанційної освіти, спричинені карантинними обмеженнями та умовами правового режиму воєнного стану.

Матеріал і методи: у дослідженні, яке тривало з 2020 по 2023 роки, взяли участь 1528 здобувачів вищої освіти з різних регіонів України. Для оцінки фізичної активності використовували Міжнародний опитувальник фізичної активності (IPAQ). Результати були піддані статистичному аналізу.

Результати: результати дослідження показників РА у студентів показали, що в середньому вони мали нормальний бал РА, який становив у юнаків 26,0 (22,0; 32,0) бали, у дівчат – 24,0 (19,0; 30,0) бали. Доведено, що порівняно зі студентками показник РА студентів чоловічої статі був статистично достовірно вищим ($U=226269,5$; $Z=7,329$; $p<0,05$). Дослідження динаміки показників РА засвідчило, що бал РА здобувачів вищої освіти, незалежно від статі, знизився з початку карантинних обмежень ($p<0,05$), але статистично не відрізнявся від докарантинного рівня ($p>0,05$) у 2021 році. Проте з початком бойових дій в Україні показник РА знизився і продовжує знижуватися. Відбулося безпрецедентне зростання відсотка здобувачів із низьким рівнем РА, який у 2023 році сягнув 43,1% та 60,1% серед студентів та студенток відповідно.

Висновки: аналіз динаміки РА у здобувачів вищої освіти за період з 2019 по 2023 рр. виявив зниження балу РА за дистанційний період навчання незалежно від статі. Винятком став лише 2021 рік, що можна пояснити адаптацією студентів до дистанційного навчання. Натомість збройний конфлікт у країні призвів до різкого зниження балу РА та статистично значущого ($p<0,05$) збільшення частки студентів із низькою руховою активністю. Причому ця тенденція зберігалася і у 2023 році. Результати дослідження дозволили оцінити масштаби негативного впливу дистанційного навчання в умовах карантинних обмежень та правового режиму воєнного стану на здобувачів вищої освіти.

Ключові слова: студенти закладів вищої освіти, рухова активність, дистанційне навчання, студентки, студенти.

Introduction

Over the last four years, Ukrainian students have been obtaining higher education in difficult conditions (Byshevets et al., 2023). Switching to remote forms of education due to quarantine measures

aimed at preventing the spread of coronavirus infection, limiting access to recreational facilities, a complication of the functioning of physical culture and sports facilities, gyms, and fitness centers, banning group training classes, reducing or banning health and physical activities events, the conditions of the legal regime of martial law – all these have led to a dramatic change in the lifestyle of student youth (Amo et al., 2022; Byshevets et al., 2023; Hemarachatanon et al., 2023). Analyzing the daily activities of students, experts note the irregularity of their organization and their chaotic content (Banakh et al., 2023). This is evidenced by untimely and irrational nutrition, systematic lack of sleep, insufficient exposure to fresh air, insufficient physical activity, and violation of the daily regime due to doing tasks at night (Dyuzhikova et al., 2022). The crisis phenomena accompanying the educational process of students had a negative impact on their physical activity (PA). Research by scientists indicates a decrease in the amount of physical activity over the period of distance education. It was determined that the proper level of PA is a factor that influences physical and psychoemotional states (Kosheleva et al., 2021). The PA classes have a positive effect on the well-being, mood, physical health, and physical and mental performance of different population groups, and allow reducing the manifestations of stress (Andrieieva et al., 2022a, b; Kashuba et al., 2021; Marchenko et al., 2023; Suwannakul et al., 2023; Zhi et al., 2022). The importance of the PA in improving mental health, which is especially relevant today, is indicated by the following authors (Andrieieva et al., 2022a; Nahorna et al., 2023; Yopa et al., 2023). Therefore, research in this field is relevant and timely.

Material and methods of research

Participant

Guided by the principles of biomedical ethics and based on informed consent, there was conducted research that involved 1,528 higher education students in humanitarian specialties from different regions of Ukraine. The average age of the interviewees was 21.0 ± 4.5 years. 45.2% of the research participants were male students, and the remaining 54.8% were female students (in 2019, 150 male students and 83 female students participated in the research; in 2020 – 60 male students and 90 female students; in 2021 – 139 male students and 163 female students; in 2022 – 277 male students and 333 female students; in 2023 – 65 male students and 168 female students).

Research organization

The research lasted from 2019 to 2023. In order to assess the PA there was used short version of the international test Questionnaire on Physical Activity (IPAQ). The short version of the questionnaire contained 7 items: the time spent on going for a walk, on high and moderate-intensity physical activities, on sedentary activity, as well as de-

mographic information about gender, age, level of education, and work. The information on physical activity in the questionnaire was presented in minutes per day and/or per week. The questionnaire was filled out independently twice with an interval of 24/32 hours between the first and second attempts. The average result was calculated. The survey was conducted annually in the first decade of April.

Statistical data analysis

Using the Shapiro-Wilk W-test, it was determined that the original data did not comply with the normal distribution (Antomonov, 2018). Therefore, the average values of indicators were presented as the median (Me), 25th, and 75th percentiles. The statistical analysis employed non-parametric tests, specifically the Mann-Whitney U-test to compare PA indicators by gender, ANOVA on ranks of PA to compare the PA indicators of male and female students across different years of the study, and Pearson's χ^2 test to compare the distributions by the level of PA (Antomonov, 2018; Kartashov, 2007). Rank PA was used to compare three or more samples as a non-parametric alternative to univariate analysis of variance. The null hypotheses were tested separately for male and female students during the implementation of rank PA to determine if their PA indicators varied across the years of the study period. For this, the Kruskal-Wallis H-criterion was calculated. On the condition that the statistical significance of the differences between RA indicators of higher education students was proven ($p < 0.05$), pairwise comparisons were used to determine in which years the students' RA scores differed from each other. The level of statistical significance was $\alpha = 0.05$ ($p < 0.05$). When $p < 1.0 \cdot 10^{-4}$, its value was presented as ($p < 0.05$).

Results of the study

The research made it possible to study and analyze the dynamics of the PA of higher education students depending on gender in the conditions of distance education over the period of quarantine restrictions and the legal regime of martial law. The analysis of variance (ANOVA) on ranks made it possible to determine that the PA of students differed statistically significantly depending on the year ($H(4, N=691) = 125.91$; $p < 0.05$). In particular, it was established that in 2020, due to switching to distance learning, students' PA decreased statistically significantly compared to the year 2019 ($U=3160.0$; $Z=3.367$; $p=0.0007$). It was established that in the following period (from 2020 to 2021), the PA of students increased statistically significantly ($U=2597.0$; $Z=-4.218$; $p < 0.05$) and reached the pre-quarantine period ($U=9344.5$; $Z=1.521$; $p=0.1281$). And in the year 2022, the PA statistically decreased ($U=8125.5$; $Z=9.618$; $p < 0.05$) compared to the year 2021. However, in 2023, the PA assessment of students did not differ statistically significantly from the year 2022 ($U=2115.0$; $Z=4.921$; $p=0.0678$) (Fig. 1). There was observed the same tendency regarding the PA of female stu-

dents ($H(4, N=837) = 161.08$; $p < 0.05$). After the announcement of quarantine restrictions, there was a statistically significant decrease in the PA assessment ($U=2115.0$; $Z=4.921$; $p < 0.05$), then its statistically significant increase ($U=3821.0$; $Z=-6.305$; $p < 0.05$) and then again, a sharp decrease in 2022 ($U=13604.05$; $Z=9.027$; $p < 0.05$). It should be noted that, unlike male students, the decrease in the PA among female students, unfortunately, continued in 2023 ($U=19548.0$; $Z=5.506$; $p < 0.05$). It turned out that the students' scores for intensive physical activity differed statistically significantly depending on gender, the average scores of which were 9.0 (6.0; 11.0) and 6.0 (4.0; 9.0) points among male and female students, correspondingly ($U=216433.0$; $Z=8.475$; $p < 0.05$).

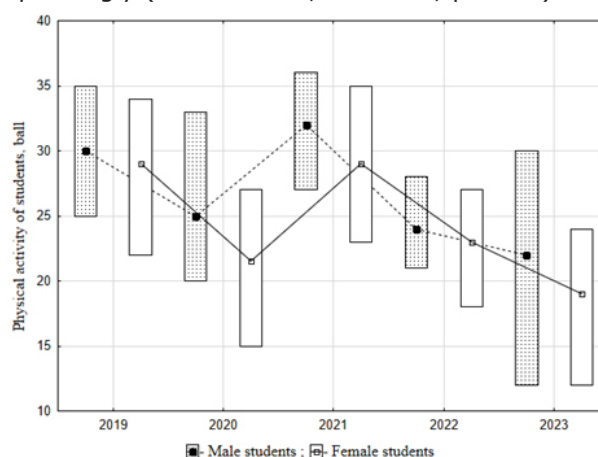


Figure 1. Changes in PA of students in the conditions of distance education, (n=1528)

Also, compared to female students, male students have higher scores for non-intense physical activity ($U=250406.5$; $Z=4.517$; $p < 0.05$) and for the sedentary PA level ($U=248146.0$; $Z=4.780$; $p < 0.05$).

As for walks, the ratings of higher education students do not differ statistically significantly ($U=273715.5$; $Z=1.802$; $p=0.0716$). Studying the dynamics of the PA indicators of students depending on gender, it was noticed that the maximum score was recorded for female students in 2019 for walking, while the minimum score was also received by female students in 2023 for staying in a sitting position (Fig. 2).

The obtained results showed that over the entire period of the research, except for the year 2021, the indicators of the PA among higher education students decreased. On average, the grades of male students for intensive load were 8.2 points per year, and those of female students were 7.5 points per year. On average, the aforementioned indicator decreased annually by 1 and 0.6 points for male and female students, respectively, or by 12.0 and 8.9% in relative terms. Moreover, it was confirmed that there was a decrease in the PA indicators for all types of physical activity. At the same time, the maximum decrease in grades was recorded for grades in the sitting position, which on average decreased every year by 18.4% for male

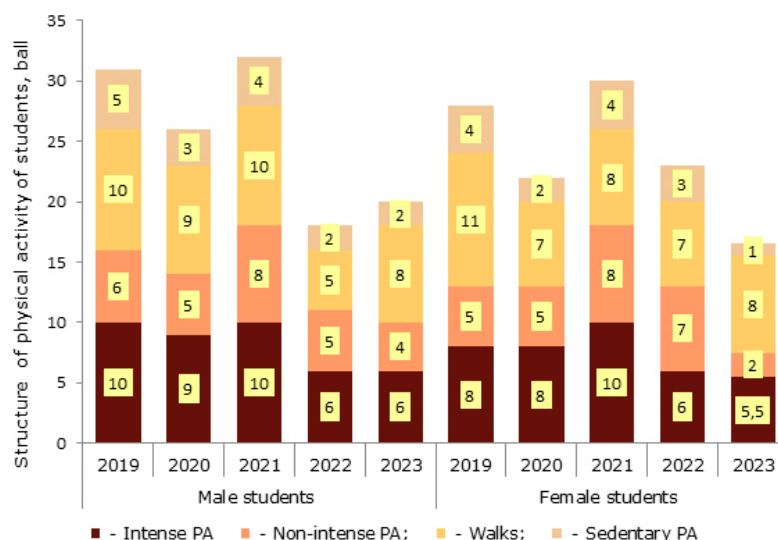


Figure 2. Changes in PA of students depending on gender, (n=1528)

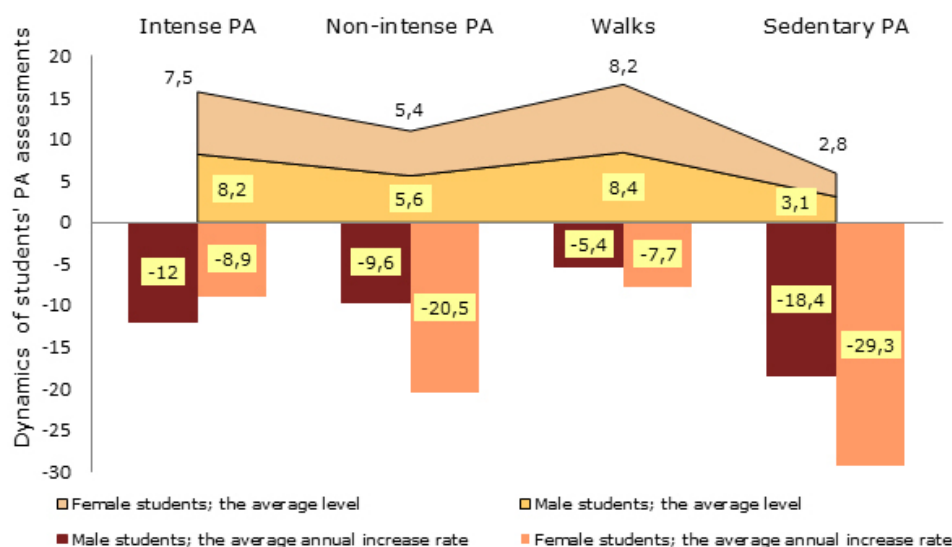


Figure 3. Changes in students' PA assessments, (n=1528)

students, and by 29.3% for female students.

It was found that over the period of the research, the annual decrease of the PA for male students was 7.5%, and 10.0% for female students. The research showed that, in general, higher education students are characterized by a normal level of PA, the assessment of which for persons aged 18 to 39 years according to the IPAQ questionnaire exceeds 21 points (Fig. 3).

Nonetheless, during specific periods, there was an observed increase in the percentage of students with insufficient physical activity (Fig. 4).

As we can see in the figure, the peaks of the growth of the percentage of students with a reduced level of PA in the conditions of crisis phenomena were over the period of the announced quarantine at first, and then – over the years of armed confrontation

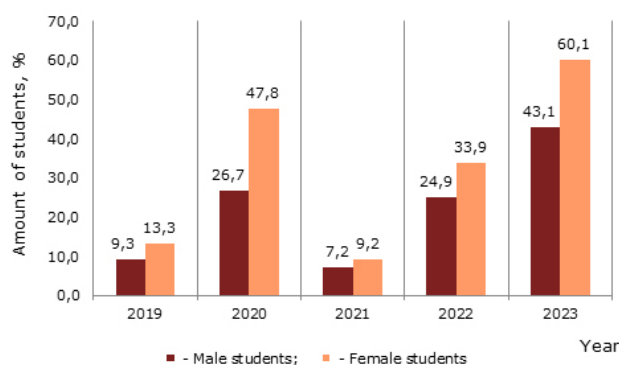


Figure 4. Dynamics of the percentage of students with a reduced level of PA in the conditions of distance education, (n=1528)

on the territory of the country. Thus, regardless of gender, in 2020 compared to the previous year, the share of students with a reduced level of PA increased statistically significantly, where the results of the statistical analysis were ($\chi^2=10.52$; $df=1$; $p=0.0012$) and ($\chi^2=23.97$; $df=1$; $p<0.05$) for male and female students, respectively. With regard to the following increase in the share of research participants with a reduced level of PA, which occurred in 2022, a statistically significant increase in the share of students with signs of physical inactivity was also proven: for male students, the calculated value of the χ^2 criterion was 18.88, and for female students – 34.96 ($p<0.05$).

It is worth emphasizing that the negative trend in reducing the PA among students is intensifying: in 2023, compared to 2022, the share of students with a reduced level of PA increased statistically significantly ($\chi^2=8.55$; $df=1$; $p=0.0035$). And, unfortunately, a similar situation was characteristic for female students as well ($\chi^2=31.29$; $df=1$; $p<0.05$).

Discussion

The issue of increasing the level of PA of various population groups remains the focus of the attention of numerous researchers. The PA of societies plays an important role in the health-forming lifestyle, which largely determines the state of health (Andrieieva et al., 2022; Grofik et al., 2021). Students of institutions of higher education, as the future elite of each of the countries, figure prominently in the research of the PA of various social and professional groups (Bland et al., 2014; Maher et al., 2021). Experts have observed a decline in physical activity levels among higher education students during their learning. This trend is linked to challenges with social communication, behavioral issues and primarily a sedentary lifestyle. All of these factors contribute to insufficient levels of physical activity. Self-isolation causes additional stress, posing a threat to mental health as well (Gillian & Ray, 2022). Due to the significant challenges that are taking place in Ukraine and the world due to quarantine restrictions and the war, the PA of various population groups has decreased significantly (Nahorna et al., 2023; Petrachkov et al., 2023). Research (Brito-Suárez et al., 2023; Sluhenska et al., 2021) has identified a decline in physical activity levels among schoolchildren. Students are a social group which is most influenced by limited mobility and decreased physical activity. Scientists pay attention to the increase in time spent in a sitting position (Stockwell et al., 2021). Students usually spend a lot of hours sitting in front of laptops and smartphones for study and leisure. This causes disorders of the musculoskeletal system (Byshevets, 2023). According to the research conducted by (Roggio et al., 2021), there has been a moderate decrease in students' PA levels: for those who were engaged in moderate-intensity activity the PA level decreased by about 6%, and for those who were engaged in in-

tensive activity it decreased by 11%. According to F. Roggio (2021), about 30% of participants did not manage to return to the level of PA they had had before the pandemic. Epidemiological studies have shown that sitting for many hours is a strong predictor of adverse health effects such as cardiovascular disease, diabetes, obesity, or depression (Hamer et al 2012; Jong-Ho et al., 2014; Stadyk, 2022). In general, it can be assumed that the more often students are physically inactive during the week, the higher the risk of musculoskeletal disorders and muscle pain. Examining the physical activity (PA) in higher education students during crisis situations that result in distance education is a crucial step in creating preventive measures to counteract negative health trends in students. The results of the study align with existing scientific data that highlights the negative trend in PA indicators among students engaged in distance learning (Byshevets, 2023). At the same time, numerous statements by scientists have been confirmed, according to which, unlike female students, male students have a higher level of PA (Hakman et al., 2023). In addition, the results we have obtained indicate that the crisis phenomena that accompany the educational process of Ukrainian students negatively affect their PA. And if a year after the beginning of quarantine restrictions, the students of higher education institutions managed to adapt and resume physical activity in 2021, then the beginning of the military conflict and its further continuation led to a sharp decrease in the PA levels of students and the preservation of the indicated negative trend.

Conclusion

The analysis of the PA dynamics of higher education students for the period from 2019 to 2023 made it possible to establish a decrease in the assessment of their PA level over the period of the research, regardless of gender. The only exception was the year 2021, which can be explained by the adaptation of students to distance learning. However, the armed conflict on the territory of the country caused a sharp decrease in the PA score and a statistically significant ($p<0.05$) increase in the share of students with signs of physical inactivity. What is more, unfortunately, the revealed trend persisted in 2023 as well. The study's outcomes aid in gauging the negative impact of crisis situations on the living activities of student youth, and provide a comprehensive understanding of the physical activity trends among higher education students in contemporary circumstances. The results serve as a foundation for the development of preventive and health measures tailored to the crisis conditions that students face.

Author's contribution

Conceptualization, O.A. and N.B.; methodology, O.A., N.B. and V.K.; software, N.B.; check, O.A and N.B.; formal analysis, O.A. and N.B.; investigation, O.A., N.B. and A.H.; resources, O.A., N.B. and A.H.; data curation, N.B.; writing – rough prepara-

tion, O.A. and N.B.; writing – review and editing, O.A., V.K. and I.G.; visualization, N.B.; supervision, O.A.; project administration, O.A. and I.G. All authors have read and agreed with the published version of the manuscript.

Conflict of interest

Authors state no conflict of interest.

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