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Mental health, sleep quality, and physical activity of medical students during the war in Ukraine

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Abstract

Background. A traumatic event like war has consequences for mental health. We examined the relationship between anxiety and depression levels, sleep quality, life satisfaction, and physical activity among Ukrainian students during the war.

Material and methods. Questionnaires were used to determine the level of anxiety and depression (HADS), the level of perceived stress (PSS-10), daytime sleepiness (ESS), sleep quality (PSQI), signs of depressive disorder (PHQ-2 and PHQ-9), typical level of physical activity, as well as manifestations of autonomic nervous system (ANS) dysfunction.

Results. Moderate and high levels of perceived stress were observed in 78.0% of girls and 60.9% of boys, and its score was inversely related to the duration of morning exercises. Mild and moderate depression was observed in 46.1% of boys and 64.4% of girls. Sleep efficiency was positively correlated with the duration of daily sports activity. Sleep duration and life satisfaction were the lowest since 2002, and the ANS dysfunction was typical although quantitatively associated with indicators of stress, depression, and anxiety.

Conclusions. The impact of war increases the risk of developing anxiety and depression in young people, reduces the duration and quality of sleep, and reduces life satisfaction, and the state of the ANS determines the degree of reaction to stress.

Keywords: armed conflict, physical activity, anxiety, depression, sleep

Introduction

Psychological and emotional well-being allows a person to overcome stress and challenges, realize their potential, express and regulate emotions, build relationships, and experience satisfaction from life. War, as a severe traumatic event, has significant consequences for mental health, especially for those who find themselves in a combat zone or have suffered from shelling [1,2]. The population of Ukraine, which has been at war for several years, has a higher prevalence of anxiety, mood disorders, and post-traumatic stress disorder (PTSD) [3]. Studies conducted in Ukraine show that short-term exposure to extreme situations has long-term consequences for the mental health of young people, especially students. More than half of those surveyed had symptoms of anxiety, as well as clinical and subclinical depression [4].

Prolonged stress and traumatic events that Ukrainians have been experiencing in the last four years due to the war has led to an increase in anxiety levels, feelings of hopelessness due to worsening living conditions, and lack of confidence in the future, which cause the

development of mental and somatic disorders, among which the most common were: sleep problems, constant headaches (often not intense), chronic fatigue, and joint pain [5]. Detailed research is needed on how the mental health of young people changes in conditions of prolonged war and which factors have a greater impact on the health of young people.

Another factor affecting health is sleep quality. Sleep deprivation negatively affects the immune system, mood, glucose metabolism, and cognitive abilities. Mental health and sleep are closely linked [6]. A study of the health of adults affected by the war in Ukraine showed that 13% of the respondents have severe sleep disorders, half (49.9%) have moderate sleep problems, 31% have subthreshold sleep problems, and only 5.5% of those surveyed have minimal or no problem [7]. Young people may be a population for whom studying the relationship between mental health and sleep quality is particularly important, especially in times of war. Students have various sleep disorders, as well as a significant decrease in physical activity due to stress, danger, and related restrictions, including deterioration of their physical and psycho-emotional state. Studies indicate the importance of physical exercise for mental health in martial law conditions [8], as well as the complex relationship between physical activity and sleep quality and the psychological resilience of students, with an overall positive impact of physical activity [9]. These results highlight the importance of exercise in improving the quality of life of people with mental health disorders. Despite the general understanding that exercise improves mood, the type and amount of exercise needed to achieve sustained results remains unclear. The influence of external factors such as the prolonged war in Ukraine on the correlation between mental health and physical activity also needs to be clarified.

The hypothesis of our study is the existence of connections between the state of the autonomic nervous system (ANS) and the severity of psycho-emotional reactions to external factors observed during martial law.

Aim of the work

The aim of this work was to study the relationship between the level of stress experienced and anxiety and depression with sleep quality, ANS state, life satisfaction, and physical activity among Ukrainian medical students under martial law.

Material and methods

The study was conducted from September 2023 to February 2024 and included a questionnaire and examination of the state of the ANS in 109 2nd year students of the medical and dental faculties, including 36 males and 73 females aged 18.7±0.1 years.

The survey included determination of the level of anxiety and depression using the Hospital Anxiety and Depression Scale (HADS) questionnaire [10], determination of the level of stress experienced using the Perceived Stress Scale (PSS-10) [11], the level of daytime sleepiness using the Epworth Scale (ESS) [12], sleep efficiency using the Pittsburgh Sleep Quality Index (PSQI) questionnaire [12,13], self-report health status – signs of depressive disorder using the Patient Health Questionnaire-2 (PHQ-2) and the Patient Health Questionnaire-9 (PHQ-9) [12], determination of the typical level of physical activity (morning exercise, sports, duration of walking during the day), and determination of manifestations of ANS dysfunction using the standard questionnaire by O.M. Wayne [14,15]. The degree of satisfaction with life was indicated by the students on an 11-point Likert scale from -5 to +5, which was accompanied by emoticons [16]. To assess the level of physical activity, we included questions on the frequency and duration of morning exercises, the frequency and duration of sports, the nature of sports, and the typical daily duration of walking during the last month. Based on these data, the weekly duration of physical activity was calculated.

Statistical analysis of data was performed using JASP 0.95.3. Quantitative indicators are given as Mean±SEM. Scale indicators with distributions that met the requirements of normality were compared using the Student's t-test. Comparisons of indicators of different groups that did not have a normal distribution and ordinal indicators (distributions by levels) were performed using the Mann-Whitney method. The Chi-square method was used to compare binary indicators. Correlation studies were performed by determining Pearson's r for scale variables and Spearman's Rho rank correlation coefficient for ordinal variables and between scale and ordinal indicators. To control the validity of the tests used, Cronbach's α coefficient was determined: for the PSS-10, Cronbach's α was 0.64; for the HADS questionnaire, Cronbach's α=0.72 for the depression scale and Cronbach's α=0.81 for the anxiety scale; for the indicators of the PHQ-9, Cronbach's α=0.84, which corresponds to the sufficient reliability of the tests used.

Results

Among respondents, 40% had been in the combat zone or shelling zone for various periods, 47% noted the presence of victims of combat among their personal circle of peers, and 31% lost their homes, including as a result of evacuation. By February 2022, 82% of students lived with their parents, while at the time of the survey – 45%.

The life satisfaction index two years after the start of the war was +1.81±0.22 (+1.74±0.37 in males, +1.84±0.27 in females, $p>0.05$). This is the lowest level registered since 2002.

The results of the PSS-10 scale were evaluated in the range from 0 to 40 points. The average score in the sample was 17.1±0.7 points, including 18.2±0.8 points for females and 14.7±1.3 points for males ($p=0.027$). Females experienced the most stress, with 78.0% of respondents experiencing moderate or high levels of perceived stress. Among males, 60.9% of respondents experienced moderate or high levels of perceived stress (Table 1).

Table 1. Indicators of the level of perceived stress according to the PSS-10 scale

Level of stress perception	Males, %	Females, %	*p*
Low level of perceived stress	39.1	22.0	0.113
Moderate level of perceived stress	56.5	68.0	
High level of perceived stress	4.4	10.0	

Subclinical or clinically expressed anxiety was detected in 25.0% of the examined males and in 42.0% of the females. In most of those surveyed, the manifestations of anxiety were within normal limits (Table 2).

Subclinical and clinically expressed depression on the HADS scale was detected in 29.2% of the males and 30.0% of the females (Table 2).

Table 2. Mental health indicators: level of anxiety and depression according to the HADS and PHQ-9 questionnaires

Indicator		Males, %	Females, %	*p*
Anxiety level (HADS)	**Normal**	75.0	58.0	0.125
	Subclinical anxiety	16.7	20.0	
	Clinically expressed anxiety	8.3	22.0	
Depression level (HADS)	**Normal**	70.8	70.0	0.914
	Subclinical depression	25.0	24.0	
	Clinically expressed depression	4.2	6.0	
Manifestations of depressive disorder (PHQ-9)	**Normal**	48.1	23.7	0.018
	Mild depression	37.0	44.1	
	Moderate depression	11.1	20.3	
	Moderately severe depression	0	6.8	
	Severe depression	3.7	5.1	

According to the PHQ-2 questionnaire, the average score of the frequency of depressive mood and anhedonia during the last two weeks in males was 1.00±0.17 points, in females – 1.09±0.11 points (p=0.673), and none of the respondents reached the limit requiring additional clinical examination and intervention.

The PHQ-9 questionnaire showed high sensitivity for assessing and monitoring the severity of depression: the average score in males was 5.56±0.92 points, in females – 8.24±0.69 points (p=0.014). In general, 46.1% of males and 64.4% of females had mild or moderate depression; this showed a greater vulnerability of females in the surveyed group. Moderately severe and severe depression were significantly less common in males and females.

It is known that anxiety and depression significantly affect sleep quality, causing disorders such as insomnia, intermittent sleep, or excessive sleepiness. The average sleep duration of the subjects was 6.5±0.2 hours. The average bedtime was 24.0±0.2 hours, the average waking time was 7.2±0.1 hours. The ESS score in the studied group of males was 7.6±0.8 points, in the group of females – 8.6±0.6 points (p=0.414). Daytime sleepiness according to the ESS was out of normal limits in 23.5% of the surveyed males and 38.3% of the females (Table 3).

Table 3. Level of daytime sleepiness according to the ESS

Level of daytime sleepiness	Males, %	Females, %	*p*
Normal	76.5	61.7	0.238
Moderate	23.5	31.9	
Excessive	0	6.4	

According to the indicators of sleep efficiency and quality (PSQI questionnaire), the difference between females and males was not statistically significant (Table 4). The global PSQI score, which reflects the degree of sleep disorders, in the studied male group was 6.4±1.0 points, in the female group – 7.3±0.4 points. The sleep efficiency indicator, which reflects the ratio of sleep time to the total time spent in bed (expressed as a percentage), in males was 93.1±1.5 %, in females 90.1±1.6 %.

The absolute majority of respondents fell into the group with very and fairly high sleep efficiency (100% of males and 95.8% of females). However, respondents had various sleep disorders, which is why most of them fell into the group of poor sleepers. Complaints of taking a long time to fall asleep were reported by 85.9% of respondents (26.2% at least 3 times a week), complaints about night awakenings – 72.3%, about night awakenings to visit the bathroom – 55.4%, about frightening dreams – 70.8%, about problems with sleep due to being cold or hot – 69.2% and 72.3%, respectively. Complaints about difficulty breathing (23.1%), coughing or snoring (21.6%), or pain (21.5%), which worsened sleep, were less common. As a result, loss of alertness during daytime activities was noted by 44.6%, at least once a week or more often – 21.5%, and about lack of mood to do things – 81.5%. Nevertheless, only 12.3% of respondents used sleeping pills.

Table 4. Sleep efficiency and quality according to the PSQI questionnaire

Indicator		Males, %	Females, %	*p*
Sleep efficiency	**Very high**	93.3	83.0	0.320
	Quite high	6.7	12.8	
	Rather low	0	2.1	
	Very low	0	2.1	
Sleep quality	**Good sleepers**	46.7	27.7	0.177
	Poor sleepers	53.3	72.3	

Students who had relatives who had been affected by hostilities went to bed later – 0.4±0.3 hours versus 23.7±0.3 hours for others (p=0.030).

A significant part of the males and most of the females showed signs of the ANS dysfunction, especially often noted by females (Table 5).

Table 5. Manifestations of the ANS dysfunction syndrome

Level of the ANS dysfunction	Males, %	Females, %	*p*
None	51.9	22.4	0.039
Moderate manifestations of the ANS dysfunction syndrome	18.5	36.2	
Severe manifestations of the ANS dysfunction syndrome	29.6	41.4	

The respondents most often noted the following reactions: tendency to blush (42.3%), tendency to turn pale (20.6%), tendency to feel numb or cold in the fingers (55.7%), tendency to feel numb or cold in the entire hands and feet (23.7%), color changes (pallor, redness, cyanosis) in the fingers (23.7%), increased sweating during excitement (53.6%), arrhythmia during excitement (35.1%), sometimes a feeling of difficulty breathing (32.0%), impaired gastrointestinal function (38.1%), paroxysmal headaches (48.5%), decreased performance, rapid fatigue (60.8%), and sleep disturbances (46.4%).

ANS regulation worsened in individuals who had peers in their personal circle affected by hostilities (27.1±2.4 points versus 20.7±2.0 points in others, p=0.043) and in those who lost their homes (30.8±0.3 points versus 20.5±1.7 points in others, p=0.002).

It is known that physical activity and exercise reduce symptoms of depression and improve overall mood in people regardless of their age. In our subjects, physical activity included: morning exercises, which were performed by 46% of males and 38% of females, (p=0.252); sports, which were regularly practiced by 85% of males and 53% of females, (p<0.001); none of these types of physical activity were practiced by 15% of males and 35% of females. However, some of the respondents from the latter group noted high physical activity by walking (on average 114±19 minutes), associated, among others, with professional activities in extracurricular time. Among students who practiced sports, 75% noted an improvement in mood after exercise, and 25% could not give an unambiguous answer, while the average duration of training among those who noted satisfaction was higher – 81±49 minutes versus 53±40 minutes among those who could not decide; but among the satisfied, 76% had not been

in a combat zone or a particularly dangerous area, while among those who did not experience an improvement in mood only amounted to 30% (p=0.009).

Numerous correlations were observed between the studied indicators. Among physically active students, the frequency of sports activities correlated with the frequency and duration of morning exercises (Rho=0.37; p=0.006 and Rho=0.32; p=0.019, respectively). The weekly duration and frequency of sports activities correlated with the total experience of sports activities (Rho=0.45; p<0.001 and Rho=0.52; p<0.001, respectively). Students who trained more during the week noted greater total physical activity (Rho=0.47; p<0.001), which was also correlated with walking (Rho=0.91; p<0.001) (Table 6). In the studied group, we did not find significant relationships between physical activity and specific stressors, except that the daily duration of sports activities slightly decreased with increasing duration of stay in a danger zone (Rho=-0.34; p=0.021). Similarly, the duration of morning exercises had an inverse relationship with the PSS-10 stress perception score (Rho=-0.30; p=0.034). Daily duration of sports activities positively correlated with sleep efficiency (r=0.32; p=0.035).

Table 6. Spearman's Rho correlation matrix of physical activity indices

Variable	Morning exercises, number per week	Morning exercise, minutes	Morning exercise, hours per week	Number of sports activities per week	Duration of sports, minutes	Duration of sports, hours per week	Improving mood after exercise
Morning exercise, minutes	0.89*	—	—	—	—	—	—
Morning exercise, hours per week	0.89*	0.86*	—	—	—	—	—
Number of sports activities per week	0.37*	0.31*	0.32*	—	—	—	—
Duration of sports, minutes	0.08	0.02	0.09	0.66*	—	—	—
Duration of sports, hours per week	0.19	0.16	0.21	0.69*	0.84*	—	—
Improving mood after exercise	0.20	0.10	0.22	0.16	0.28*	0.22	—
Total physical activity, minutes per week	0.22	0.22	0.19	0.45*	0.43*	0.47*	-0.02

Notes: * indicates statistically significant correlation coefficients.

The PSS-10 stress perception score was inversely correlated with life satisfaction (r=-0.44; p<0.001). The PSS-10 perceived stress score also directly correlated with the duration of stay in a danger zone (r=0.26; p=0.041), with anxiety symptoms according to the HADS (r=0.73; p<0.001) and with depression symptoms according to the HADS (r=0.64; p<0.001), with the severity of the ANS dysfunction (r=0.58; p<0.001) (Table 7).

Table 7. Pearson's r correlation matrix of psycho-emotional and nervous system indices

Variable	Anxiety score (HADS)	Depression score (HADS)	PSS-10 score	ESS score	Sleep time (hours)	Sleep quality score	Duration of stay in a danger zone, weeks	Life satisfaction, points	PHQ-9 score
Depression score (HADS)	0.68*	—	—	—	—	—	—	—	—
PSS-10 score	0.73*	0.64*	—	—	—	—	—	—	—
ESS score	0.55*	0.37*	0.53*	—	—	—	—	—	—
Sleep time (hours)	-0.22	-0.26	-0.12	-0.21	—	—	—	—	—
Sleep quality score	0.45*	0.46*	0.44*	0.41*	-0.67*	—	—	—	—
Duration of stay in a danger zone, weeks	0.21	0.16	0.26*	0.29*	-0.26	0.44*	—	—	—
Life satisfaction, points	-0.48*	-0.46*	-0.44*	-0.46*	0.20	-0.45*	-0.13	—	—
PHQ-9 score	0.63*	0.61*	0.56*	0.36*	-0.13	0.50*	0.29*	-0.54*	—
ANS dysfunction score	0.57*	0.43*	0.58*	0.31*	-0.23	0.35*	0.13	-0.34*	0.47*

Notes: * indicates statistically significant correlation coefficients.

The HADS anxiety score correlated with the HADS depression score (r=0.68; p<0.001) and with the ANS dysfunction (r=0.57; p<0.001). The HADS depression score was slightly less correlated with the ANS dysfunction (r=0.43; p<0.001).

The ESS score was directly correlated with the duration of exposure to the danger zone (r=0.29; p=0.029). The level of sleepiness was higher in individuals with worse depressive

disorder on the PHQ-2 score and PHQ-9 score (Rho=0.40; p=0.003 and Rho=0.36; p=0.007, respectively) and contributed to the negative impact of depressive symptoms on daily activities (Rho=0.39; p=0.003). The sleepiness score also significantly correlated with the overall sleep quality score (r=0.41; p=0.002), with the perceived stress score on the PSS-10 scale (r=0.53; p<0.001), with anxiety symptoms on the HADS scale (r=0.55; p<0.001), somewhat lower – with depression symptoms on the HADS scale (r=0.37; p=0.005), and with the ANS dysfunction score (r=0.32; p=0.018).

Bedtime was correlated with greater manifestations of depression (Rho=0.32; p=0.018), anxiety (Rho=0.30; p=0.027), a higher degree of daytime sleepiness (Rho=0.29; p=0.031), the severity of the ANS dysfunction (Rho=0.28; p=0.040), and a deterioration in the overall sleep quality index (Rho=0.46; p<0.001).

The global PSQI score correlated with all indicators of psychological state disorders: with manifestations of anxiety and depression according to the HADS questionnaire (r=0.45; p<0.001 and r=0.46; p<0.001, respectively), with the PSS-10 score of the perceived stress (r=0.44; p<0.001), with the PHQ-9 depression index (r=0.48; p<0.001), as well as with manifestations of the ANS dysfunction (r=0.41; p=0.002).

Subjective sleep quality assessment (PSQI), as well as depressive disorder symptoms (PHQ-9), worsened with increasing the ANS dysfunction (Rho=0.39; p=0.004 and Rho=0.53; p<0.001, respectively).

Subjective assessment of life satisfaction was inversely correlated with the presence of peers in their personal circle affected by hostilities (Rho=-0.35; p<0.001), with signs of depressive disorder on the PHQ-9 scale (Rho=-0.44; p<0.001) and their impact on daily activities (Rho=-0.31; p<0.005), with manifestations of anxiety and depression on the HADS scale (Rho=-0.35; p=0.005 and Rho=-0.41; p<0.001), with the degree of daytime sleepiness on the ESS (Rho=-0.40; p=0.002), with the subjective sleep quality index, the general sleep quality index, and the severity of daytime dysfunction (Rho=-0.35; p=0.008, Rho=-0.34; p=0.011 and Rho=-0.53; p<0.001 respectively), and with the level of the ANS dysfunction (Rho=-0.34; p<0.001).

To better understand the changes that occurred as a result of the influence of martial law conditions, we compared the obtained data with our data obtained before the war (2002-2021) in the same social group [17-20]. In peacetime, almost twice as many students practiced sports: 79.8% of boys and 75.8% of girls [21]. Both sleep duration and life satisfaction in junior university students decreased compared to peacetime (Figures 1 and 2).

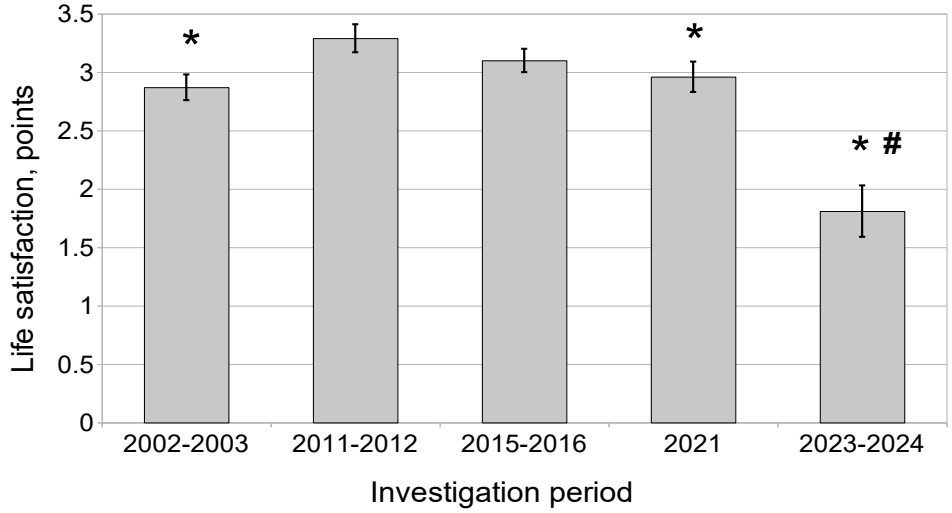

Figure 1. Changes in the level of life satisfaction in junior medical students
Notes: * – statistically significant differences compared to the indicators of 2011-2012; # – statistically significant decrease in indicator compared to the indicators of all the previous studies.

A decrease in sleep duration occurred after the transition to the credit-modular system of education, but life satisfaction increased at the same time. Life satisfaction began to decline during the COVID-19 pandemic, but psychological factors associated with the war had a much greater impact on it. At the same time, a significant reduction in sleep duration occurred (Figure 2).

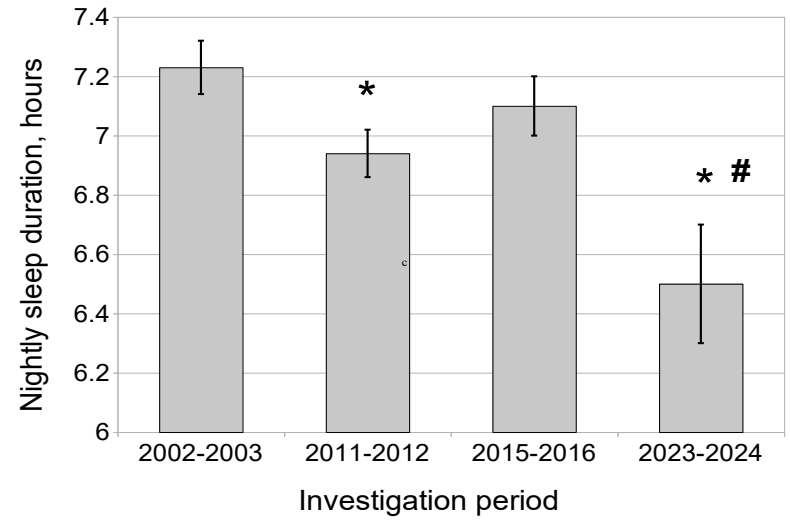

Figure 2. Changes in the duration of night sleep in junior medical students (this survey was not conducted in 2021-2022)

Notes: * – statistically significant differences compared to the indicators of 2002-2003 (the period with the highest indicator of sleep duration); # – statistically significant decrease in indicator compared to the indicators of all previous studies.

However, despite all adverse factors and changes in psychological state, dysregulation of the ANS in young people during all observation periods had similar values, and the indicators of the ANS dysfunction in females always exceeded the indicators in males (Figure 3). The largest changes in the ANS indicators were observed during the COVID-19 pandemic and were observed precisely in females, while in males, there were no significant changes at all. Signs of the ANS dysfunction during the war in young people were at the levels detected in 2011-2012.

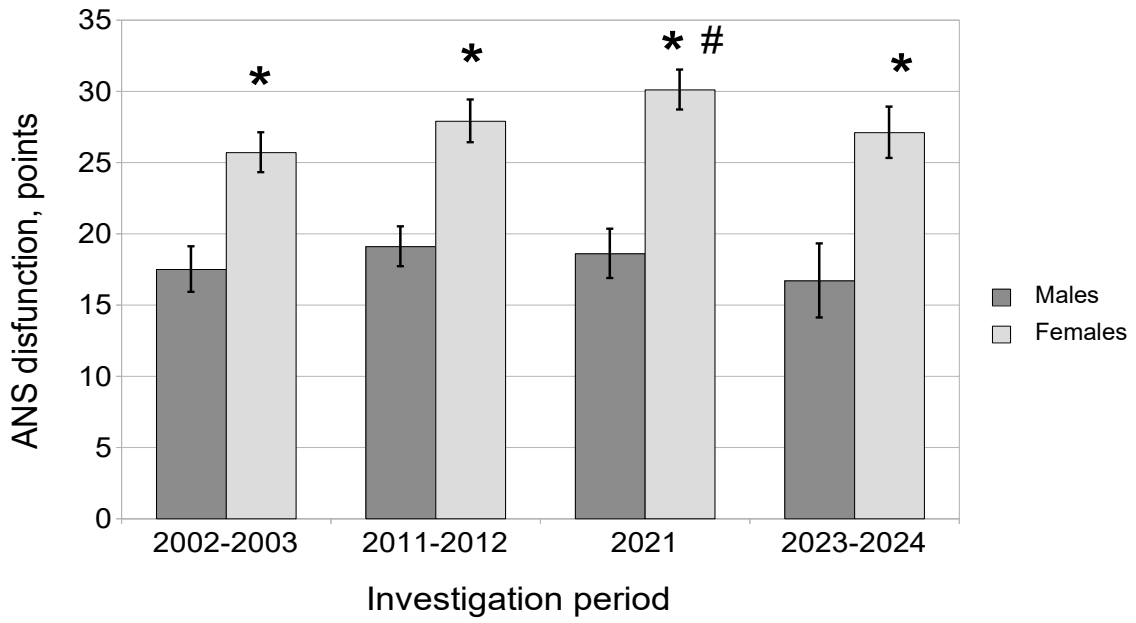

Figure 3. The ANS dysfunction index in junior medical students (in 2015-2016, this study was not conducted)

Notes: * – statistically significant differences between the indicators of males and females; # – statistically significant excess of indicators in females compared to the indicators of 2002-2003.

This phenomenon, combined with a number of clear correlations of the ANS state with indicators of anxiety, depression, stress perception, and sleep disorders, gives reason to assert that the magnitude of psychological health disorders caused by external factors depends on the functional state of the ANS. The state of the ANS, although dependent on external influences,

is both a direct and, at the same time, an intermediate link in the implementation of mental health changes in response to external stress factors.

Discussion

Our study demonstrated that, while in a country where missile warnings and life-threatening situations are constant, the majority of student youth had moderate to high levels of perceived stress. Females, more than males, perceived their lives as stressful, unpredictable, and uncontrollable. They, more than males, lose confidence in their ability to cope with difficulties.

An analysis of mental health conducted by Melnyk et al. [21] showed that young people in Ukraine who changed their place of residence during the war had symptoms of severe depression (8.3%), moderately severe depression (28.8%), and severe anxiety (19.7%). In our sample, after two years of war, the level of depressive disorder covered almost half of the respondents. All this indicates that war, especially long-term, significantly affects the development of depression and increases the level of anxiety, reducing resistance to stress factors.

Research by Raniti et al. [22], conducted in peaceful life, noted the connection between sleep problems, especially insomnia, and the occurrence of depression in adolescents. It is poor sleep, in their opinion, that mediates the consistent comorbidity between anxiety and depression. Our subjects had an average sleep duration of 6.5±0.2 hours, while the recommended sleep duration for young people is from 7 to 9 hours [23].

The subjects had sleep disturbances, such as prolonged time to falling asleep, night awakenings, frightening dreams, and waking up from a feeling of cold or heat. A study conducted among Norwegian students showed that the longer the sleep duration, the greater the satisfaction with life [23].

Studies conducted in Germany among adults showed that people who slept approximately 8 hours per night had higher life satisfaction [24]. Sleep quality in our subjects was closely related to anxiety and depression, as well as to perceived stress. Young people who had shorter sleep duration and poorer sleep quality were more likely to have higher levels of anxiety and depression. Similar associations were observed during the COVID-19 pandemic [25]. A large study conducted among college and university students in Norway showed a link between short sleep duration and the presence of most mental disorders [26]. However, improving sleep quality, according to Wang et al. [27], led to a decrease in anxiety and

depression. In our opinion, to prevent the development of anxiety and depression, it is extremely important to study sleep problems among young people under conditions of prolonged psychological stress, such as a prolonged war [27]. This is all the more relevant because circadian rhythm disorders are associated with manifestations of more severe mental illnesses [28].

Our data suggest that physical activity had a smaller effect on the psychological state of young people during wartime than was found in peacetime [29]. This requires further investigation. We did not find such connections between the level of physical activity and the state of the ANS, which were found in peacetime, although the connections of the ANS regulation with the duration of sleep and its disorders were observed as before [17]. It can be assumed that the manifestations of stress reactions in wartime conditions cannot be compensated by the positive influence of physical activity, primarily due to the peculiarities of stress influences. Daily repeated air alarms (from 2 to 7, lasting up to several hours), which arose unpredictably at any time of the day, including at night, led to a constant state of stress. All this prevents the restoration of the regulation of the ANS, which could be facilitated by physical activity. However, the level of perceived stress decreased with an increase in the duration of morning exercises, while being in areas adjacent to a combat zone led to an increase in the level of perceived stress and a decrease in sports activity.

Conclusions

War, as a psycho-traumatic factor, causes exacerbation of existing mental disorders in young people and increases the risk of developing anxiety and depression in students even if they were in a fairly safe region during the study period. Those who were in a combat zone, lost their homes, and whose loved ones suffered from shelling are especially vulnerable.

A moderate and high level of perceived stress was observed in 78.0% of females and 60.9% of males. The PSS-10 stress perception score had an inverse relationship with the duration of morning exercises. Young people are in a state of emotional instability, unpredictability, and uncertainty about the future, which leads to an increase in the development of anxiety and depression. Mild and moderate depression (by PHQ-9) was experienced by 46.1% of males and 64.4% of females.

Those surveyed had various sleep disorders, such as reduced sleep duration, prolonged time to falling asleep, night awakenings, and frightening dreams. Less frequently there were complaints of difficulty breathing, coughing or snoring, or pain that worsened sleep. The

average duration of sleep was 6.5±0.2 hours, which is shorter than the recommended duration. Sleep efficiency was positively correlated with the daily duration of sports.

The level of life satisfaction among the respondents had the lowest rate, in comparison with the data obtained in the same social group since 2002. Against this background, the connections between the level of physical activity and psycho-emotional state were less pronounced than observed in peacetime; however, daily morning exercises were associated with a lower perception of stress.

The observed stability of average levels of the ANS dysfunction in the presence of correlations with levels of perceived stress, anxiety and depression, sleep quality, and life satisfaction gives reason to assert that it is the state of the ANS that largely determines the nature of reactions to external stress factors. We confirmed our hypothesis that there are relationships between the severity of psycho-emotional reactions, the quality of sleep to external factors observed during martial law, and the level of dysfunction of the ANS in young people.

An important direction in the future is the study of measures and interventions to improve sleep, adapted to the unique needs of young people, which may represent a new approach to preventing the development of mental disorders. To improve psychological resilience, it is necessary to study in more depth the functional state of the ANS, specifically in young people, and the features of its regulation in females, with the development of methods for the prevention of ANS regulation disorders and their careful correction.

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