Journal of Physical Education and Sport ® (JPES), Vol. 24 (issue 4), Art 102, pp. 894 - 904, April 2024
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Evaluation of emotional disorder risk in students with low physical activity levels under stressful conditions

NATALIIA BYSHEVETS[1], OLENA ANDRIEIEVA[2], LIUBOMYR PASICHNIAK[3], NATALIIA GONCHAROVA[4], OLENA YARMAK[5], IEVGENIIA ZAKHARINA[6], TARAS BLYSTIV[7]
[1,2,3,4,7] National University of Ukraine on Physical Education and Sport, Kyiv, UKRAINE
[5]The National Defence University of Ukraine named after Ivan Chernyakhovsky, Kyiv, UKRAINE
[6] National University «Zaporizhzhia Polytechnic», Zaporozhye, UKRAINE

Published online: April 30, 2024
(Accepted for publication April 15, 2024
DOI:10.7752/jpes.2024.04102

Abstract:
The ongoing hostilities in Ukraine require adjustments to the educational process for higher education students, particularly the implementation of measures to mitigate the effects of emotional disorders through physical activity. Of significant practical interest to researchers is the assessment of emotional disorder risk, characterized by negative reactions among students to crisis situations, including emotional distress such as anxiety and aggression, amid ongoing military operations in Ukraine. This study aimed to identify higher education students at risk of emotional disorders under the influence of stress factors, particularly military actions. **Material and methods**. The study was run from April 20 to June 20, 2022. The study involved 573 higher education students from different regions of Ukraine. During the period of the study, 78.0% of respondents were in the country, of whom 45.5% had a negative experience of being in the area of active hostilities. The following methods were used: analysis of scientific and methodological literature, sociological methods, methods of physical activity assessment, and mathematical statistics. **Results**. It was found that the appearance of the signs of emotional disorders did not depend on the actual experience of being in the epicentre of hostilities, however, it was shown that female students were more prone to manifestations of emotional distress compared to male students. The respondents were divided into two clusters. Cluster 1 was formed by 53.4 % of students with emotional disorders, and cluster 2 consisted of 46.6 % of students with increased tolerance to stress factors. Cluster 1 included mostly female students. The outbreak of hostilities was accompanied by the emergence of psychological problems in them, the emergence or increase of bad habits against the background of a predominantly sedentary lifestyle, low levels of physical activity, and less attention to their own health. Furthermore, regardless of the cluster, university students report a deterioration in their physical condition. A classification tree was built, which allows to correctly evaluate the degree of risk of developing emotional disorders with a probability of 85 %. **Conclusion**. Up-to-date information on students' response to stressful conditions is of great practical importance for the development and implementation of measures aimed at their prevention and correction through physical activity in the educational process of higher education institutions.
Keywords: distance learning, negative experiences, questionnaire, classification tree.

Introduction

In the 21st century, crisis phenomena have been haunting humanity for a long time. It can be stated that Ukrainian students have been getting higher education under stressful conditions for the third year in a row (Hakman et al., 2020; Lukyanov et al., 2019; Shynkaryk et al., 2022). Initially, as a result of quarantine restrictions due to the COVID-19 pandemic, higher education institutions had a very short period to start commonly using distance learning methods. Subsequently, active hostilities began on the territory of Ukraine which became a continuation of the military confrontation in the east of the country started in 2014 (Andrieieva et al., 2023; Kichuk, 2020). The war not only exacerbated social and economic problems in the country but also led to mass deaths of soldiers and civilians, destruction of the housing fund, and other catastrophic consequences (Petrachkov et al., 2023). On the territory of Ukraine, there is an emergency situation of a military nature at the state level characterized by a violation of the normal conditions of life and activities of people on the territory of the country caused by the military conflict posing a threat to the life and health of people. This military conflict has caused social, economic, and environmental impacts not only on the countries involved in the conflict but also on the global world (Costa et al., 2023).

Scientists widely discuss issues related to human behavior in extremely stressful situations (Kurapov et al., 2023). They study the peculiarities of the emotional response to crisis phenomena when the population not only turns out to be at the epicenter of tragic events but also becomes an active participant in them, underlining the fact that experiencing a crisis phenomenon is accompanied by negative physiological changes (Sharun et al., 2022; Su et al., 2022).

Corresponding Author: OLENA ANDRIEIEVA E-mail: olena.andreeva@gmail.com

The authors indicate the peculiarities of the mental condition of military personnel who carry out combat missions in the conditions of armed local conflicts and the expediency of using means of physical activity in medical and psychological rehabilitation (Kokun, 2004; Kravchenko et al., 2017; Stanchenkov et al., 2021; Bryant et al., 2022). At the same time, there is limited scientific information concerning the civilian population who found themselves in the zone of active hostilities. As indicated by O.A. Panchenko et al. (2014), much less attention has been paid to the mental and physical condition of the population during hostilities than to the mental condition of the direct participants in hostilities. The specificity of the victims' reactions to the influence of extreme factors, as well as their dynamics over time, largely determine the strategy and tactics of measures aimed at overcoming stress (Panchenko et al., 2015). The experience of scientific and pedagogical activity shows that at present there is an urgent need to adapt the educational process to the implementation of educational activities of students in the conditions of a military conflict. The study of students' response to stress factors mainly concerns their adaptation to educational activities upon admission to higher education institutions or during the exam session, quarantine restrictions, remote forms of learning, or challenges in the employment market (Sokolov, 2015; Chub et al., 2020; Shpak, 2021).

Some recent studies have partially examined students' reactions to hostilities in the Ukraine and mental health (Lotzin et al., 2023; Pinchuk et al., 2024). Furthermore, researchers demonstrated the widespread prevalence of post-traumatic stress disorder symptoms (66%), moderate and severe anxiety symptoms (45%), and moderate and severe depression symptoms (47%) among higher school students (Pinchuk et al., 2024).

The study of the mental health of students who had lived in the capital of Ukraine during the active phase of hostilities in Kyiv and Kyiv region showed a significant impact of war-related stressors and a high risk of developing post-traumatic stress disorder. The authors consider systematic mental health assessment to be one of the priority measures to prevent the development of mental health disorders.

Post-traumatic stress disorders, which develop as emotional, cognitive, and behavioral responses to stress, often occur during war and significantly reduce the quality of life and daily life activities of students living in the conflict zone (Rogowska et al., 2023). Particular attention is needed for people who have been exposed to sexual violence or had cumulative trauma (Lotzin et al., 2023). However, in general, the authors emphasize the need for targeted psychosocial interventions for these categories of people (Lotzin et al., 2023).

Moreover, researchers believe that the means of preventing mental health disorders should be aimed at reducing anxiety as a factor of the greatest impact on students' mental health (Pavlova et al., 2024).

Meanwhile, according to our assumptions, the crisis situation in the country has affected the physical and psycho-emotional condition of the youth. They show signs of emotional disorders (Byshevets et al., 2022; Meshko, 2023). Therefore, determining the degree of emotional disorders of student youth against the background of prolonged military operations in the country is of considerable practical interest to scientists. Deterioration of the emotional condition is manifested by negative reactions of the individual to crisis phenomena (Panchenko et al., 2015), including manifestations of emotional distress (anxiety, aggression, etc.) (Nemesh, 2021). Assessment of the emotional well-being of student youth, the level and dynamics of their mental and physical conditions under the influence of stress will allow identification of students at risk of developing emotional disorders and implementation of measures to prevent and correct the consequences of students' emotional disturbances through physical activity (Gustems-Carnicer et al., 2019).

Thus, the development of effective algorithms for assessing the mental state in students who have been or are currently under the influence of stressors can significantly optimize approaches to the prevention of mental health disorders in higher school students and requires scientific justification.

Material and methods

Participants. The research was conducted in the period from April 20 to June 20, 2022. During this period, 573 students of higher education institutions from different regions of Ukraine, including Kyiv, Chernihiv, Uzhhorod, Kryvyi Rih, and Zaporizhzhia, took part in the survey. Among the surveyed, there were 41.7 % male students. The average age of the surveyed was 19.7±2.7 years. All participants took part in the research on the basis of a voluntarily confirmed informed consent which described all the stages and procedures of the research, having got acquainted with all the features of the research that could affect their decision.

Procedure. There were applied a questionnaire and methods of mathematical statistics (descriptive statistics, frequency, correlation, cluster analysis, and a decision tree construction). The employees of the National University of Ukraine on Physical Education and Sport developed and grounded the questionnaire "Response of Ukrainian higher education students to the hostilities in the country" containing two groups of questions. The information block included 7 questions, including information about the educational institution, the gender of the respondent, their place of residence, plans for the future, peculiarities of studying in extreme conditions, etc. The second block, the main one, consisted of 20 questions and was aimed at identifying the signs of social stress disorder in students under the influence of the military conflict, and the measures used by the respondents to overcome it. Some questions involved choosing one of the offered answers, for example, Yes / Rather yes / Rather no / No; some of them involved choosing all the appropriate statements; others involved entering absolute values or points. In the questions related to the assessment of the physical and psycho-

emotional condition, students were asked to choose the most characteristic assessment of indicators on a 5-point scale before and after the start of hostilities. Thus, the physical condition is evaluated from 1 to 5, where 1 is lethargic, 5 is agitated, and the psycho-emotional condition is rated from 1 to 5, where 1 is apathetic, 5 is irritated, which allowed confirming or denying the fact of worsening of the condition. The reliability of the questionnaire was checked with the help of Cronbach's alpha test and using the method of decomposition. The online survey was conducted on the basis of a random sample of students during educational activities at the higher education institution, as well as those students who had received information about the research and volunteered to participate in it. The questionnaire presented with the help of Google Forms was distributed using the most popular messengers.

Statistical analysis. The synchronous reliability of the questionnaire and the internal consistency of the questions of its main block were proven. Cronbach's alpha coefficient was 0.785, and standardized Cronbach's alpha coefficient was 0.746. Reliability coefficients for the questions of the questionnaire correspond to the normative indicator of the criterion of synchronous reliability, the correlation value at removal ranged from 0.751 (indicator "Well-being") to 0.800 (indicator "Presence of negative psycho-emotional symptoms"), that is, they exceeded 0.7. In addition, the reliability of the main block of the questionnaire was checked with the help of the method of decomposition (spline reliability), in which the test questions were divided into two parts (odd and even) and the correlation between them was established.

Calculations showed that the correlation between groups of questions is high and is 0.686 (Table 1).

The obtained results also indicate the reliability and internal consistency of the questionnaire "Response of Ukrainian higher education students to the hostilities in the country". Please note that the answers received were coded to perform the appropriate calculations to assess the reliability of the questionnaire, as well as to construct a classification tree, instead, the cluster analysis was performed without prior coding by means of Data Mining (Narkevich et al., 2021).

Table 1. Results of the spline reliability test of questions of the main block of the questionnaire (n=573)

Correlation. 1 and 2 parts of the questionnaire: 0.686 Split-half reliability: 0.814; Gutman's split-half: 0.807		
Positions	Being in a combat zone / Negative symptoms / Self-education / Taking sedatives / Attention to health / Activity / Mood / Work capacity / Deterioration of psycho-emotional condition	Psychological problems / Applied measures / Health-improving physical activity / Harmful habits / Lifestyle / Sleep / Appetite / Well-being / Deterioration of physical condition
Average	22,41	27,06
Amount	12841,0	15508,0
Standard deviation	3,93	4,67
Variance	15,46	21,81
Alpha	0,55	0,70

With the help of the Generalized Data Mining Clustering module using the EM clustering method with V-fold cross-tabulation, which allows automating the process of establishing the number of clusters, students were divided into homogeneous clusters including respondents who have similar responses to today's challenges. It should be noted that the EM clustering algorithm belongs to non-hierarchical algorithms, which, instead of cluster centers, assume the presence of a probability density function for each of the clusters with the corresponding value of mathematical expectation and variance, and the partition search is carried out according to the rule of maximum likelihood. At the same time, this clustering method gives better results in the case of overlapping clusters. With the help of Data Mining technology using the CHAID method, a classification tree was constructed. The description of the data set for constructing the classification tree is presented in the table (Table 2).

Table 2. Description of the data set for assessing the reliability of the questionnaire

N	Column name	Code	Interpretation of the code
1	Place of residence	No code	Name of the city
2	Educational institution	No code	Abbreviation of the higher education institution
3	Sex	1 / 0	Male / Female
4	Age	No code	Absolute value of age
5	Being in a combat zone	1 / 0	Yes / No
6	Plans for the future	1 / 0	Live and work in Ukraine / Abroad
7	Are there any studying problems?	1 / 0	Yes / No
8	Are there any psychological problems?	5 / 4 / 3 / 2	No / Rather no / Rather yes / Yes
9	Implementation of anti-stress measures	0 / 1 / 2	No / Yes / Physical activity
10	Self-education, self-improvement	5 / 4 / 3 / 2	Yes / Rather yes / Rather no / No
11	Health-improving physical activity	5 / 4 / 3 / 2	Yes / Rather yes / Rather no / No
12	Taking sedatives	5 / 4 / 3 / 2	No / Rather no / Rather yes / Yes
13	Appearance / intensification of bad habits	5 / 4 / 3 / 2	No / Rather no / Rather yes / Yes
14	Health care	5 / 4 / 3 / 2	Yes / Rather yes / Rather no / No
15	Lifestyle	5 / 4 / 3 / 2	Active / Passive / Does not contribute to maintaining health / In extreme conditions

16	Evaluation of each quality, score	activity	No code	From 1 to 5, where 1 is the lowest score, 5 is the highest one
17		sleep		
18		mood		
19		appetite		
20		working capacity		
21		well-being		
22	Usual psycho-emotional condition, score	Before hostilities	No code	From 1 to 5, where 1 is apathetic, 5 is irritated
23		At the time of the survey		
24	Usual physical condition, score	Before hostilities	No code	From 1 to 5, where 1 is lethargic, 5 is agitated
25		At the time of the survey		
26	*Change in psycho-emotional condition*		1 / 0	Deterioration was observed / Deterioration was not observed
27	*Change in physical condition*			

Note: data calculated or obtained as a result of analysis are in italics.

Descriptive statistics was used at the initial stage of the research, at the stage of studying the contingent of respondents. A comparative analysis of the studied indicators of higher education students in the conditions of crisis phenomena assigned to different clusters was carried out using the Mann-Whitney U-test, and a comparison of psycho-emotional and physical condition assessments before and after the start of the hostilities was performed using the Wilcoxon signed-rank test. With the help of frequency analysis, there were established the differences between the shares of respondents assigned to different clusters based on the answers to the questions of the questionnaire. For this purpose, Pearson's chi-squared test (χ^2) was used. Correlation analysis of dichotomous variables was carried out using the Chuprov-Kramer coefficient φ. Guided by the recommendations of scientists, a classification tree was constructed with the help of the Data Mining technology using the CHAID method. Note that during the clustering and constructing the classification tree, coding of the questionnaire data was not carried out since modern Data Mining technologies allow analyzing not only numerical but also textual information. At all stages of statistical analysis, the level of significance at the level of $\alpha = 0.05$ was agreed. Provided that the value of p exceeded 0.001, it was presented in a rounded form, and in the other case - "$p < 0.05$".

Results

It was established that during the survey, 78.0% of the respondents were on the territory of the country, while 17.7% of them were evacuated, and the rest stayed at home. 18.7% were abroad, and another 3.3% of students were members of the territorial defense of cities. Among students, 45.5% had a negative experience of being in a zone of active hostilities. Therefore, a significant part of student youth could potentially get social stress disorders. Regarding plans for the future, 59.9% of respondents said that they intend to live and work in Ukraine; 7.3% of students decided to live and work abroad; 5.1% would like to live and work in Ukraine but do not see any prospects for themselves, and the remaining 27.7% of respondents indicated that for that moment they had not decided yet how to build their future.

It was established that only 19.2% of students of higher education institutions did not identify signs of emotional distress upon the start of hostilities in the country. Instead, in various combinations, 62.3% of respondents experience anxiety, 58.5% - mood swings, 37.0% - depression, and 22.2% - aggressiveness. At the same time, almost a third part of students, 29.7%, notice three or four symptoms of emotional distress at the same time. As for the measures taken to combat stress, 77.1% are engaged in physical culture and sports and/or recreational activities, including hiking and cycling in the fresh air, 41.2% of respondents are inclined to engage themselves in art or handicrafts, 39, 3% become calmer by studying, learning foreign languages, helping people, animals, etc. However, 8.7% of respondents noted that they have no methods to calm themselves down or do not have such an opportunity. As can be seen, the majority of representatives of the student youth of higher education institutions try to engage in constructive activities, in particular sports, volunteering, art, etc., in order to overcome the consequences of crisis phenomena. However, unfortunately, 26.9% of respondents systematically use sedatives or sleeping pills, 24.6% admitted that they have developed or increased bad habits, and only 37.7% of respondents noted that they continue to lead an active lifestyle. At the same time, 35.1% of respondents stated that their psycho-emotional and physical condition had deteriorated after the start of hostilities in the country. In the course of the research, there were several assumptions put forward. One of them concerned the impact of the negative experience of being in a zone of active hostilities on the psycho-emotional and physical condition of students of higher education institutions. However, the assumption was not confirmed: no statistically significant correlation was found between the negative experience and deterioration of the psycho-emotional condition (χ^2=0.92; p=0.339; φ=0.04) and physical (χ^2=0.64; p=0.423; φ=0.03) condition. From our perspective, this result is explained by the inclusion of young people in a psycho-traumatic situation, regardless of their location. Moreover, as we believe, the factor of the crisis phenomenon was intensified through mass media. It has been proven that the appearance of symptoms of emotional distress does not depend on the

experience of being in the epicenter of hostilities. And, even the opposite, some students who were in relative safety got some symptoms (Figure 1). Thus, the share of students with symptoms of anxiety who were not in the zone of active hostilities is statistically significantly (χ^2=4.04; p=0.045) higher than the share of students who had a negative experience. On the other hand, the rest of the studied symptoms were more characteristic of students who were in the zone of active hostilities, however, it was not possible to prove the statistical significance of the differences. The share of students showing aggressiveness (χ^2=0.19; p=0.664), having depressive states (χ^2=3.29; p=0.070), mood swings (χ^2=0.85; p=0.358) did not differ statistically significantly depending on whether they had experience of being in a zone of active hostilities.

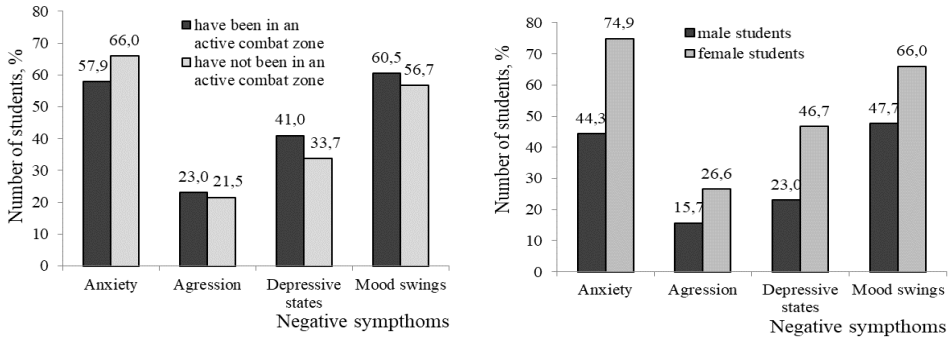

Figure 1. Frequency of emotional distress symptoms depending on negative experiences (n=573)

On the other hand, we believed that female students are more prone to worry compared to male students, and also put forward the assumption that male students are more prone to aggression. In this case, despite the revealed statistical significance between gender and deterioration of psycho-emotional and physical condition, the correlation turned out to be very weak: (χ^2=13.40; p<0.05; φ=0.15) and (χ^2=10, 92; p=0.001; φ=0.14) for psycho-emotional and physical condition, respectively. It was established that female students indicated the presence of such symptoms as anxiety, aggressiveness, depressive states, and mood swings more often than male students. Shares of female students with manifestations of anxiety (χ^2=55.25; p<0.05), aggression (χ^2=9.52; p=0.003), depressive states (χ^2=33.59; p<0.05), and mood swings (χ^2=19.15; p<0.05) statistically significantly outweigh the share of male students with such characteristics. As can be seen, as a result of the research, some of our assumptions were confirmed, and some of them were refuted. At the next stage of the research, all the obtained data were subjected to the clustering procedure. As a result of the division implemented with the help of intelligent data analysis, which along with numerical data analyzes textual information as well, all surveyed students were divided into two clusters. Cluster 1 included 53.4% (n=306) of students, and the remaining 46.6% (n=267) formed Cluster 2. It was found that the representatives of different clusters differ statistically significantly according to all qualitative variables, except for the experience of being in a combat zone and engaging in self-education/self-improvement, as well as by all quantitative variables except for the assessment of the psycho-emotional condition before the start of hostilities (Table 3).

Table 3. Comparative analysis of categorical and continuous data

Categorical indicator	Calculation results			Continuous variables	Calculation results			
	df	χ^2	p		Between SS	Within SS	F	p
Place of residence	4	49,27	<0,05	Age	68,6	3968,1	9,87	0,002
Educational institution	9	57,11	<0,05	Activity	201,5	500,9	229,74	<0,05
Sex	1	54,85	<0,05	Sleep	100,3	580,0	98,70	<0,05
Current residence	3	13,85	0,003	Mood	191,5	401,1	272,60	<0,05
Being in a combat zone	3	6,89	0,075	Appetite	152,2	577,8	150,43	<0,05
Plans for the future	3	10,06	0,018	Work capacity	257,2	544,4	269,74	<0,05
Are there any studying problems?	3	59,14	<0,05	Well-being	255,5	419,8	347,57	<0,05
Are there any psychological problems?	20	152,69	<0,05	Psycho-emotional condition (before)	0,002	455,0	0,003	0,959
Negative symptoms	3	167,08	<0,05	Psycho-emotional condition (actual)	21,9	621,6	20,12	<0,05
Anti-stress measures	15	89,30	<0,05	Physical condition (before)	31,9	526,7	34,54	<0,05
Self-education	28	6,75	0,080	Physical condition (actual)	194,3	513,5	216,11	<0,05
Taking sedatives	3	81,43	<0,05	Note: Between SS – variance between groups; df=m-1, m – number of groups (clusters); Within SS – intragroup variance; df=n-m, n – the number of observations in each of the groups; F – F-test; з – significance level reached1111к				
Appearance of bad habits	3	42,47	<0,05					
Health care activities	3	29,65	<0,05					
Lifestyle	3	115,73	<0,05					
Note: df=n-1, n is the number of possible answer options								

Studying the characteristic features of students assigned to different clusters, a number of regularities were found. The specific characteristics of students assigned to Cluster 1 were: the majority of the contingent is female (χ^2=54.85; p<0.05); the beginning of hostilities was accompanied by the appearance of psychological problems among the representatives of Cluster 1 (χ^2=137.94; p<0.05); a lower level of physical activity compared to the participants of Cluster 2 (χ^2=54.78; p<0.05); more frequent usage of sedatives (χ^2=71.49; p<0.05); the beginning of hostilities in the country caused the appearance or intensification of bad habits (χ^2=33.35; p<0.05); in different combinations, they are bothered by at least three signs of emotional distress (χ^2=120.40; p<0.05); half of the representatives are characterized by a passive lifestyle (consistency criterion χ^2=0.052; p=0.819); during the period since the beginning of hostilities on the territory of the country, there has been a statistically significant decrease in the psycho-emotional condition of the representatives of Cluster 1 from 3 (2; 3) to 2 (2; 3) points (T=10562.5; Z=4.057; p<0.05); before the start of hostilities they had lower indicators of physical condition compared to the participants of Cluster 2.

Regarding the specific characteristics of students assigned to Cluster 2, the following was found: Cluster 2 includes more representatives of the male gender; no complaints about the emergence of psychological problems upon the beginning of hostilities in the country; a higher level of physical activity compared to the representatives of Cluster 1; no need to use sedatives; there was no appearance or intensification of bad habits; paying more attention to their health (χ^2=20.09; p<0.05); a larger part of them does not identify any signs of emotional distress (χ^2=62.34; p<0.05); the majority of participants have an active lifestyle (consistency criterion χ^2=66.61; p<0.05); students remained balanced: regardless of the beginning of hostilities their psycho-emotional condition scores were 3 (2; 3) points (T=3743.0; Z=0.772; p=0.440). There are also common features between representatives of different clusters.

Thus, regardless of the cluster, the following common features were found: dividing students into clusters did not depend on the experience of being in a zone of active hostilities (p=0.075); students engage in self-education to the same extent (p=0.080); before the beginning of hostilities, the psycho-emotional condition of students did not differ (p=0.959); there was a statistically significant decrease in physical condition: from 4 (3; 4) to 3 (2; 3) points (T=2650.5; Z=10.524; p<0.05) of the representatives of Cluster 1 and from 4 (3; 5)) to 4 (3; 4) points (T=2837.0; Z=4.561; p<0.05) of the representatives of Cluster 2. Such indicators as activity, sleep, mood, appetite, work capacity, and well-being of the representatives of Cluster 2 exceed the corresponding indicators of students united in Cluster 1 (p < 0.05) (Figure 2).

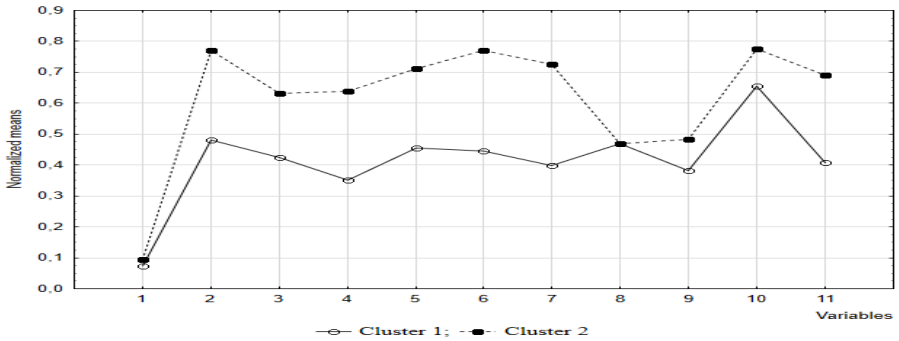

Figure 2. Graph of means for continuous variables: 1 – age; 2 – activity; 3 – sleep; 4 – mood; 5 – appetite; 6 – work capacity; 7 – well-being; 8 – psycho-emotional condition (before); 9 – psycho-emotional condition (actual); 10 – physical condition (before); 11 – physical condition (actual)

Thus, it can be stated that the representatives of Cluster 2 adapted more easily to crisis conditions, including due to an active lifestyle, intensified physical activities, and care about their health. At the same time, from our point of view, the factor that contributed to better resistance to crisis phenomena of the students of Cluster 2 was the increased level of physical condition before the beginning of hostilities in the country compared to the one of the students of Cluster 1 (p < 0.05).

Cluster 1 representatives can be conventionally called students with stress-related disorders, and Cluster 2 representatives can be conventionally called students with increased resistance to crisis phenomena.

In the course of the research, based on empirical data and guided by the recommendations of scientists, a classification tree was constructed with the help of Data Mining technology using the CHAID method (Figure 3).

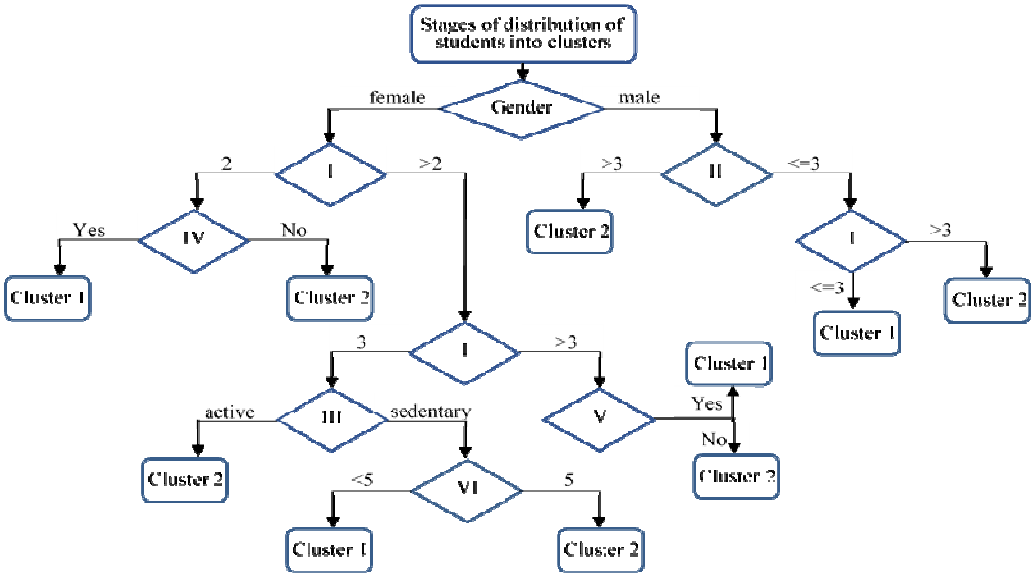

Figure 3. Algorithm for developing a methodology for identifying higher education students with a stress-associated condition based on the "classification tree".

There was offered a technique for identifying higher education students with a stress-related condition based on the developed classification tree. The methodology includes a series of questions answering which makes it possible to assign a higher education student to one or another cluster. The algorithm for developing the methodology is presented in the figure. The questions to the students should be formulated taking into account their gender. If it is a female student, we find out their well-being and draw conclusions depending on its assessment: if the female student rates it less than or equal to 2, we assign them to Cluster 1; if the female student assesses their well-being as satisfactory (three points) and at the same time has an active lifestyle we assign them to Cluster 2; if they score three points, have a passive lifestyle, but have a good or excellent appetite (scores it 4 or 5 points), they go to Cluster 2; if the female student assesses their well-being as good or excellent but does not complain about the presence of psycho-emotional problems we assign them to Cluster 2. If this is a male student, we find out the level of their physical activity and, depending on their assessment, draw conclusions: if a male student assesses it as unsatisfactory or satisfactory and at the same time is characterized by unsatisfactory or satisfactory well-being, then we assign them to Cluster 1, and in the opposite case they are assigned to Cluster 2; if the male student's well-being is good or excellent, then they are assigned to Cluster 2. The research showed that the classification of the student using the constructed tree has an error of 15.0 ±1.5%. Therefore, in 85% of cases, a series of simple questions allows determining the degree of risk of emotional disorders of a student correctly. Operative information about students' responses to stressful events is important for the development and implementation of preventive measures in the educational process of higher education institutions.

Discussion

The population of the country is gaining an extremely negative experience, and a considerable part of people have suffered and continue to suffer as a result of the military conflict on the territory of the country (Frankova et al., 2022). Having studied the scientific sources highlighting information on the consequences of crisis phenomena, we found that the majority of publications aimed at determining the response of individuals to stress related to the military (Byshevets et al., 2023; Panchenko et al., 2015; Pavlova et al., 2023). As for civilians, there are much fewer scientific studies. Usually, these are medical or psychological studies aimed at developing and implementing into practice clinical and organizational models of comprehensive care for the population living on the territory where military operations took place and requiring psychological and psychiatric care (Nemesh et al., 2023; Hartmann et al., 2023). However, as the survey showed, student youth in the conditions of hostilities on the territory of the country are not only experiencing a difficult situation but also need to express their feelings and thoughts on this issue (Sheather, 2022). Therefore, it is imperative that the educational framework be modified to accommodate the learning needs of students in the midst of military conflict. It is our contention that the efforts of physical education teachers, together with the creation and application of educational technologies designed to mitigate emotional disturbances among university students through physical education and sport, could play a crucial role in mitigating the effects of exposure to hostilities. Such measures would facilitate the continuation of educational activities even under crisis conditions. Formulating this particular approach involves assessing the emotional health of the student population,

monitoring the status and progression of their psycho-emotional and physical well-being in the midst of the crisis, and identifying those students who are more vulnerable to stress-related problems (Pels et al., 2022).

In order to effectively address the psycho-traumatic effects of military conflict in the country, it's important to first understand and articulate how students are responding to these stressors (Levin et al., 2023). The military threat and military actions on the territory of the country make the population have negative emotions among which fear is the biggest one and its main behavioral consequences are panic, aggression, and apathy; and an emergency situation can cause different reactions depending on the nature of a person, their involvement in the situation and the possibilities of adaptation. At the same time, as a result of a long stay in a life-threatening emergency situation, personality changes that can lead to maladaptation or socially dangerous behavior are formed. Studying the peculiarities of people's behavior in the conditions of crisis phenomena and their consequences we paid attention to the definition of "emotional distress", which is characterized by the instability and inadequacy of emotional reactions and is expressed in the predominance of negative emotions, anxiety, and fears. On the other hand, the term "social stress disorder" seems to be more acceptable; as mentioned above, it defines the state of personal maladjustment under the influence of a crisis phenomenon, and the degree of its manifestation depends both on the personal characteristics of the individual and the intensity and duration of the psycho-traumatic situation. Thus, in our opinion, social stress disorder includes emotional distress manifested in the appearance of anxiety, depressive states, mood swings, and aggression.

Given the impact of the military conflict on different regions of Ukraine, there's an urgent need to adapt the educational strategies of higher education institutions to facilitate learning in the midst of hostilities. In order to help students cope with the effects of such conflicts through physical education and sport, a comprehensive survey was conducted. The survey aimed to understand the impact of military action on the physical and psycho-emotional wellbeing of university students, and to identify those at higher risk of experiencing social stress-related disorders. Using tools such as the Zung Self-Rating Depression Scale, Reeder's Psychological Stress Scale, and scales measuring stress regulation and emotional distress, we developed and administered the "Response of Ukrainian Higher Education Students to the Hostilities in the Country" questionnaire.

This tool was validated to ensure its reliability in capturing students' experiences and reactions to the conflict. Since the survey of students began some period after the beginning of hostilities on the territory of Ukraine (April 20), we assumed that in our case we could talk about signs of social stress disorders that may manifest under the influence of hostilities on the territory of the country. Analyzing the manifestations of social stress disorders of the civilian population in a situation of hostilities, in which 201 respondents took part - adults (18-70 years old) of various social statuses 72.1% of whom consider themselves witnesses of hostilities, O. Panchenko found their dominant feeling to be anxiety (2015). As can be seen, our research confirms the data of the literature: most of the student youth we interviewed were also characterized by anxiety. Again, students rated their activity, work capacity, and emotional condition as satisfactory, as well as those interviewed in the study of O. Panchenko (2015). It turned out that students who did not directly witness the armed confrontation reacted to the events in the country in the same way as students who were directly in the zone of active hostilities (Kurapov et al., 2023). This confirms the negative reaction of people to an extreme event even if they are bystanders. Based on the data collected by the researcher, 51.7 % of participants reported a decline in their emotional well-being, while a decline in physical health was less common, affecting 28.4 % of respondents. Conversely, our study found that university students experienced a statistically significant ($p<0.05$) decline in their physical health, according to their self-assessments. Perhaps this can be explained by a decrease or a sharp limitation of physical activity of students during the military conflict which caused them to feel the deterioration of their physical condition (Lannoy et al., 2023). At the same time, our assumption that female students react more strongly to crisis phenomena compared to male students was confirmed. Scientists note a significant positive effect of motor activity in reducing stress among different population groups (Andrieieva et al., 2019, 2021; Drozdovska et al., 2020; Hakman et al., 2020) and among students (Kuswahyudi et al., 2022; Pascoe et al., 2020; Singh et al., 2022; Yilmaz et al., 2016).

Conclusions

The questionnaire "Response of Ukrainian higher education students to the hostilities in the country" was developed and grounded. It was established that the appearance of signs of emotional disorders does not depend on the experience of being in the epicenter of hostilities. Female students were more prone to anxiety, depression, and mood swings compared to male students. Students were divided into two clusters: Cluster 1 was formed by students with manifestations of emotional disorders, and Cluster 2 was formed by students with increased resistance to stressful events. Cluster 1 included students with low physical activity and lower indicators of physical condition, which were statistically significantly different ($p < 0.05$) compared to the participants of Cluster 2. A classification tree was constructed which allows identifying students at risk of emotional disorders against the background of hostilities in the country for further introduction of preventive and health-improving measures into the educational process of higher education institutions.

At the theoretical level, the role and place of physical activity in mitigating the negative impact of a stressful conditions (being in a combat zone) on the psychological state of students and their ability to cope with the influence of stressors, was proved.

From a practical point of view, a scientifically justified algorithm for the methodology of identifying higher education students with stress-associated conditions based on the "classification tree" was proposed, which allows to assess through simple questions the risks of mental health disorders in students and to take prompt action to prevent and manage disorders.

Conflict of interest Authors state no conflict of interest.

Funding. The study was carried out in accordance with the Plan of scientific research work of NUFVSU for 2021–2025 according to the theme of the department of health, fitness and recreation "Theoretical and technological foundations of health and recreational motor activity and healthy lifestyle of different population groups" (state registration number 0121U107534) and topics of the applied research carried out at the expense of the expenses of the general fund of the state budget of the Ministry of Education and Culture of Ukraine "Reducing stress-related risks in military personnel and youth of Ukraine by means of health-recreational physical activity" (state registration number 0124U000705).

References

Andrieieva, O., Byshevets, N., Kashuba, V., et al. (2023). Changes in physical activity indicators of Ukrainian students in the conditions of distance education. *Rehabilitation and Recreational Health Technologies*, 8(2), 75–81. doi.org: 10.15391/prrht.2023-8(2).01

Andrieieva, O., Kashuba, V., Carp, I., Blystiv, T., et al. (2019). Assessment of emotional state and mental activity of 15-16 year-old boys and girls who had a low level of physical activity. *Journal of Physical Education and Sport*, 19, 1022–1029. https://doi.org/10.7752/jpes.2019.s3147

Andrieieva, O., Kashuba, V., Yarmak, O., et al. (2021). Efficiency of children's fitness training program with elements of sport dances in improving balance, strength and posture. *Journal of Physical Education and Sport*. 21. 2872-2879. https://doi.org/10.7752/jpes.2021.s5382

Andrieieva, O., Kashuba, V., Yarmak, O., et al. (2021). Efficiency of children's fitness training program with elements of sport dances in improving balance, strength and posture. Journal of Physical Education and Sport. 21. 2872-2879. https://doi.org/10.7752/jpes.2021.s5382

Bryant, R. A., Schnurr, P. P., Pedlar, D. (2022). Addressing the mental health needs of civilian combatants in Ukraine. *The Lancet Psychiatry*, 9(5), 346-347.

Byshevets, N., Andrieieva, O., Goncharova, N., et al. (2023). Prediction of stress-related conditions in students and their prevention through health-enhancing recreational physical activity. *Journal of Physical Education and Sport*, 23(4), 937-943. doi.org: 10.7752/jpes.2023.04117

Byshevets, N., Goncharova, N., Serhiienko, K., et al. (2022). Peculiarities of behavior and reactions of students of higher education in physical culture and sports under the influence of crisis phenomena. *Scientific Journal of M. P. Dragomanov National Pedagogical University,* 8(153), 21-25. doi.org: 10.31392/NPU-nc.series15.2022.8(153).05.

Chub, O. & Ilyenko, A. (2020). Youth adaptation to the labor market challenges. *Herald of Khmelnytskyi national university. Economic sciences,* 6(288), 32-40. doi.org: 10.31891/2307-5740-2020-288-6-5.

Costa J.P., Silva A.L., Barcelò D., Rocha-Santos T., Duarte A. (2023). Threats to sustainability in face of post-pandemic scenarios and the war in Ukraine. *Science of The Total Environment*, Vol. 892, 164509. doi.org: 10.1016/j.scitotenv.2023.164509.

Drozdovska, S., Andrieieva, O., Yarmak, O., & Blagii, O. (2020). Personalization of health-promoting fitness programs for young women based on genetic factors. *Journal of Physical Education and Sport*, 20, 331–337. https://doi.org/10.7752/jpes.2020.s1046

Frankova, I., Vermetten, E., Shalev, A.Y., et al. (2022). Digital psychological first aid for Ukraine. *The Lancet Psychiatry,* 9(7), E33. doi.org: 10.1016/S2215-0366(22)00147-X.

Gustems-Carnicer, J., Calderón, C. & Calderón-Garrido, D. (2019). Stress, coping strategies and academic achievement in teacher education students. *European Journal of Teacher Education*, 42(3), 375–390. doi:10.1080/02619768.2019.1576629

Hakman, A., Andrieieva, O., Bezverkhnia, H., et al. (2020). Dynamics of the physical fitness and circumference sizes of body parts as a motivation for self-improvement and self-control in students. *Journal of Physical Education and Sport*, 20(1), 116–122. https://doi.org/10.7752/jpes.2020.01015

Hakman, A., Andrieieva, O., Kashuba, V., Omelchenko, T., Ion, C., Danylchenko, V., & Levinskaia, K. (2019). Technology of planning and management of leisure activities for working elderly people with a low level of physical activity. *Journal of Physical Education and Sport*, 19, 2159–2166. https://doi.org/10.7752/jpes.2019.s6324

Hartmann, U., Kleinert, J., Wegner, M. & Pels, F. (2023). Presentation and evaluation of the stress lab - A tool to prepare physical education students to handle stressful teaching situations. *Journal of Physical Education and Sport*, Vol. 23 (11), 2903-2916. doi:10.7752/jpes.2023.11331

Kichuk, A. V. (2020). Some features of changes in the psycho-emotional health of students and factors that cause them during quarantine restrictions. *Theoretical and applied problems of psychology*, 3(53), 5-18. doi.org: 10.33216/2219-2654-2020-53-3-5-18.

Kokun, O. M. (2004). Optimisation of human adaptive capacities: psychophysiological aspect of activity support: monograph. Kyiv: Millennium, 265 p.

Kravchenko, K. O., Timchenko, O. & Shirobokov, Y. M. (2017). Socio-psychological determinants of combat stress in military personnel - participants of the anti-terrorist operation: monograph. Kharkiv: NUCSU Publishing House, 256 p.

Kurapov, A., Kalaitzaki, A., Keller, V., et al. (2023). The mental health impact of the ongoing Russian-Ukrainian war 6 months after the *Russian invasion of Ukraine. Front Psychiatry*, 14, 1134780. doi: 10.3389/fpsyt.2023.1134780.

Kurapov, A., Pavlenko, V., Drozdov, A., Bezliudna, V., Reznik, A., & Isralowitz, R. (2023) Toward an Understanding of the Russian-Ukrainian War Impact on University Students and Personnel. *Journal of Loss and Trauma*, 28, 2, 167-174, doi: 10.1080/15325024.2022.2084838

Kuswahyudi, Setiakarnawijaya, Y., Widiastuti, Yuliasih, Fitranto N., Taufik, M. S., et al. (2022). Effect of aerobic exercise on stress reduction and weight loss in obese students using circuit training. *Journal of Physical Education and Sport*, 22(12), 3038-3043. doi.org: 10.7752/jpes.2022.12384

Lannoy, L., Barbeau, K., Vanderloo, L. M., et al. (2023). Evidence supporting a combined movement behavior approach for children and youth's mental health – A scoping review and environmental scan. *Mental Health and Physical Activity*, 24, 100511. doi.org: 10.1016/j.mhpa.2023.100511.

Levin, Y., Ben-Ezra, M., Hamama-Raz, Y., et al. (2023). The Ukraine–Russia war: A symptoms network of complex posttraumatic stress disorder during continuous traumatic stress. *Psychological Trauma: Theory, Research, Practice, and Policy*. doi.org: 10.1037/tra0001522

Lukyanov, A. S. & Fursova, D. V. (2019). The relationship between anxiety and aggressive behaviour in students with different academic success: results of the study. *Problems of modern pedagogical education*, 64(1), 341-344.

Lotzin A., Morozova-Larina O., Paschenko S., Paetow A., Schratz L., Keller V., Krupelnytska L. (2023). War-related stressors and ICD-11 (complex) post-traumatic stress disorders in Ukrainian students living in Kyiv during the Russian-Ukrainian war. *Psychiatry Research*, Vol. 330; 115561. https://doi.org/10.1016/j.psychres.2023.115561.

Meshko, H. M., Meshko, O. I., & Habrusieva, N. V. (2023). The Impact of the War in Ukraine on the Emotional well-being of Students in the Learning Process. *Journal of Intellectual Disability - Diagnosis and Treatment*, 11(1), 55–65. https://doi.org/10.6000/2292-2598.2023.11.01.7

Narkevich, A. N., Vinogradov, K. A. & Grzhibovsky, A. M. (2021). Intelligent methods of data analysis in biomedical research: classification trees. *Human Ecology*, 3, 54-64.

Nemesh, V. I. (2021). Psychological model of overcoming emotional distress in adolescence. *Scientific Notes of V.I. Vernadsky TNU*, 32(71), 129-134. https://doi.org/10.32838/2709-3093/2021.3/21

Panchenko, O. A., Panchenko, L. V. & Zaitseva, N. A. (2015). Social-stress disorders in the civilian population in the situation of combat operations. *Nauka i osvita*, 1, 136-140.

Panchenko, O. A., Kutko, I. I. & Zaitseva, N. A. (2014). Socio-stress disorders: the civilian population in the epicentre of military actions. *Newspaper "Novini meditsiny ta pharmatsii"*, 15(509). URL: http://www.mif-ua.com/archive/issue-34297/

Pascoe, M. C., Hetrick, S. E. & Parker, A. G. (2020). The impact of stress on students in secondary school and higher education. *International Journal of Adolescence and Youth,* 25(1), 104–112. doi.org: 10.1080/02673843.2019.1596823.

Pavlova I., Rogowska A.M. & Zhang S.X. (2023). Mental Health and well-being During the COVID-19 Pandemic and After the Russian Invasion of Ukraine. *Journal of Community Health*, doi: 10.1007/s10900-023-01273-x

Pels, F., Hartmann, U., Schäfer-Pels, A. & von Haaren-Mack, B. (2022). Potential stressors in (prospective) physical education teachers: a comparison of different career stages. *German Journal of Exercise and Sport Research. Vorab-Onlinepublikation*. doi:10.1007/s12662-022-00804-3

Petrachkov, O., Yarmak, O., Shostak, R., et al. (2023). The effect of stress factors on cognitive and management functions of cadets of higher military educational institutions. *Journal of Physical Education and Sport*, 23, 162-169. doi.org: 10.7752/jpes.2023.01020

Pinchuk, I., Solonskyi, A., Yachnik, Y., Kopchak, O., Klasa, K., Sobański, J. A., Odintsova, T. (2024). Psychological well-being of Ukrainian students three months after the emerge of full-scale war. *Psychiatria Polska*, 58(1), 121-151. doi.org: 10.12740/PP/177073

Rogowska A.M., Pavlova I. A path model of associations between war-related exposure to trauma, nightmares, fear, insomnia, and posttraumatic stress among Ukrainian students during the Russian invasion (2023). *Psychiatry Research*, Vol. 328, 115431. doi.org: 10.1016/j.psychres.2023.115431.

Sharun, A., & Yuryeva, L. (2022). Clinical-psychopathological and psychometric features of maladaptive disorders which are a characteristic of students who have experienced psycho-emotional stress. *Medicni Perspektivi*, 27(2), 88–95. doi: 10.26641/2307-0404.2022.2.260257

Sheather, J. (2022). As Russian troops cross into Ukraine, we need to remind ourselves of the impact of war on health. *BMJ*, 376, o499. https://doi.org/10.1136/bmj.o499.

Shpak, M. M. (2021). Psycho-emotional state of students under distance learning. *Scientific Bulletin of Kherson State University. Series «Economic Sciences»,* 4, 115-121. doi.org 10.32999/ksu2312-3206/2021-4-15

Shynkaryk, O., Borysenko, V., Byshevets, N., et al. (2022). Risk assessment of sports activity and the impact of economic and demographic indicators during the COVID-19 pandemic. *Journal of Physical Education and Sport,* 3(22), 672-679. doi.org: 10.7752/jpes.2022.03084.

Singh, B., Olds, T., Curtis, R., et al. (2022). Effectiveness of physical activity interventions for improving depression, anxiety and distress: an overview of systematic reviews. *British Journal of Sports Medicine Published,* 57:1203-1209. doi.org: 10.1136/bjsports-2022-106195

Sokolov, G. A. (2015). Optimisation of psychoemotional state of students during the session. *Psychologist*, 1, 28-43. doi: 10.7256/2409-8701.2015.1.13888

Stanchenkov, I. V., Chistyakov, S. I. & Suslov, A. G. (2021). Assessment of the clinical effectiveness of the organizational model of medical and psychological rehabilitation based on the analysis of the dynamics of the indicators of the mental status in military personnel exposed to combat stress. *Medico-Biological and Socio-Psychological Problems of Safety in Emergency Situations*, (2), 115-122. doi.org: 10.25016/2541-7487-2021-0-2-115-122

Su, Z., McDonnell, D., Cheshmehzangi, A., et al. (2022). Public health crises and Ukrainian refugees. Brain, Behavior, and Immunity, 103, 243-245.

Yilmaz, T., Top, E., & Akil, M., (2016). Levels of approaching and avoiding emotional situations of the students studying in the faculties of sport sciences. *Journal of Physical Education and Sport*, vol.16, no.1, 258-263. doi: 10.7752/jpes.2016.01041