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## Assessing the impact of stress factors of the educational process on psychosomatic health of schoolchildren in the conditions of the Russo-Ukrainian war

**Abstract.** In the conditions of the current full-scale Russo-Ukrainian war, there is an increase in cases of depression, apathy, anxiety and different disorders, as well as other psychological problems that affect the academic process and psychosomatic health of schoolchildren in Ukraine, which makes this problem an important topic for study. The purpose of the research was to characterize the kinds of stress factors in the educational environment and their possible effects on schoolchildren's bodies both in peacetime and wartime conditions; and to assess the real impact of school stress on the psychosomatic health of schoolchildren by taking an experimental approach. The theoretical method made it possible to analyze, synthesize, systematize and summarize the information on stress factors of the educational process affecting schoolchildren which is available in academic literature. The experimental research involved schoolchildren attending gymnasiums (high schools) in Pereiaslav, Kyiv Region. An anonymous questionnaire survey for parents was used to determine the presence of anxiety, its causes and consequences for the schoolchildren under examination. The surveyed gymnasium students were tested to determine academic stress, self-assessment of stress resistance and resilience. It has been established that the academic environment of Ukrainian educational institutions in the wartime conditions is characterized by the emergence of numerous stress factors. The high school students under examination had a high level of anxiety, a low level of stress resistance and an average level of resilience. The obtained results of the test to determine academic stress have demonstrated that the educational process had a negative impact on the health and academic performance of schoolchildren. The increase in stress factors during the large-scale Russo-Ukrainian war had a negative impact on the psychosomatic health, academic performance and social adaptation of schoolchildren to learning. Results of this research can be used for development and implementation of psychoprophylactic measures meant to reduce stress conditions in schoolchildren both in the school environment and at home, therefore promoting a favorable psychological environment and well-being

**Keywords:** stress; schoolchildren; stress resistance; resilience; anxiety; academic performance

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## INTRODUCTION

As a result of the full-scale Russian invasion to Ukraine on 24 February 2022, Ukraine's secondary education has suffered heavy human and material losses. During combat activities and Russian occupation, many people have perished including educators, schoolchildren, their parents and relatives. Many secondary education institutions have been destroyed, damaged or plundered. Because of the war, millions of students and educators had to relocate: some locally in Ukraine and others abroad (Kohut *et al.*, 2023). Therefore, the increase in stress factors of the modern educational process in the wartime conditions and their negative impact on schoolchildren's psychosomatic health make this problem especially relevant. Overcoming the dreadful challenges of war, all participants of the educational process continued studies in distance or mixed form, with forced interruptions caused by air raid alarms or power cuts. The abovesaid learning conditions have had a negative influence on the quality of the educational process and schoolchildren's performance, and affected their psychological and emotional state in an especially severe way. Meanwhile, despite the abovementioned circumstances, teachers performed their professional duties, motivating schoolchildren to achieve a high level of knowledge and skills, conducting tests in accordance with the curriculum, and providing a proper amount of homework. As a consequence, most present-day schoolchildren have to face stress conditions and feel their negative consequences. Depression, anxiety and various psychological issues are becoming more and more widespread, which affects schoolchildren's studies and overall state of health. Being aware of stress in the educational process also has a negative influence on their academic performance. In addition, stress interferes with concentration, memory and development of creative skills which subsequently impairs academic results.

Before 24 February 2022, Ukrainian scientists mostly studied the stress factors that emerged in the educational process during peacetime conditions. In the conditions of the Russo-Ukrainian war, it is worth studying the new stress factors affecting schoolchildren that are related to war, combat operations, and occupation as well as the ways and methods of eliminating consequences of stress caused by such factors; new research works have emerged that focus on current problems in organizing and ensuring security of educational environments in Ukraine. In particular, organization of the educational process in conditions of martial law is covered by materials of the all-Ukrainian scientific and pedagogical vocational training (Kohut *et al.*, 2023). Such scholars as N.I. Kotsur & L.P. Tovkun (2023) studied formation of psychological safety of the educational environment in the conditions of the Russo-Ukrainian war. The authors note that the number of threats and dangers seriously affecting schoolchildren's and students' psychosomatic health has increased during the Russo-Ukrainian war. Effects of the Russo-Ukrainian war on the nation's mental health are revealed in the research by N.I. Kotsur (2022). Psychological peculiarities

in manifestation of stress and resilience in schoolchildren are also covered in the article by O.M. Basenko (2019). According to T.M. Titarenko & T.O. Larina (n.d.), a person's resilience is currently considered a social necessity and an element of safety. Such scientists as G.M. Danylenko *et al.* (2023) emphasize that doctors and psychologists should monitor the health conditions of internally displaced schoolchildren for effects of the current war in Ukraine. Meanwhile, A. Mina *et al.* (2023) note that armed conflicts cause problems with nutrition and housing, which affects schoolchildren's emotions and behavior, provoking an increase in the spread of mental illnesses among children. As a consequence, this will have a negative effect on their adaptation and functioning in adult life. In their work, A. Kadir *et al.* (2018) remarked that armed conflicts severely damage children of various ages as they affect their physical, mental, and behavioral health throughout all of their lives. Taking into account the colossal scale of current armed conflicts in the world, it is important that children's health care specialists should understand those consequences and react to them in a timely manner not only in specific countries affected by conflicts, but in worldwide terms as well. G.J. Jucier *et al.* (2022) emphasize that continued war in Ukraine threatens lives and well-being of millions of children as they are subjected to permanent artillery bombardments and risk of injuries. It will have grave long-term consequences for their mental health and is certainly a threat for their future. M. Mohseni *et al.* (2020) also hold to the opinion that armed conflicts or wars have never had any positive effect on children's health.

Stress factors (academic, social and emotional pressure, family problems and physical stress) all have a negative impact on schoolchildren's health, academic performance, and social adaptation. In this connection, more attention should be paid to psychological well-being of schoolchildren, and if necessary, special measures have to be developed and implemented to reduce the influence of such stress factors both in domestic environment and in educational institutions. That being said, the purpose of the research was to characterize the kinds of stress factors in the educational environment and their possible effects on schoolchildren's bodies both in peacetime and wartime conditions; and to assess the real impact of school stress on the psychosomatic health of schoolchildren by taking an experimental approach. The task of the research is to analyze the various kinds of stress factors of the educational process for schoolchildren under present conditions; and to determine, by an experimental approach, the real situation with effects of school stress on somatic and mental health of schoolchildren as exemplified by ninth form students of high schools in Pereiaslav, Kyiv Region. The novelty of the research is that within the framework of the said problem, it is the first time that the effects of war-related stress factors of the educational process on schoolchildren's somatic and psychological condition have been assessed. At a later stage, it will allow us to develop

effective strategies to support schoolchildren's psychosomatic health in the complicated wartime environment.

## LITERATURE REVIEW

Teaching schoolchildren at institutions of comprehensive secondary education in the conditions of the Russo-Ukrainian war has a negative influence on their physical and mental health. It is closely connected with the effects of such negative stress factors as psychological stress, oversaturation with information, bullying, regular ailments, increased anxiety due to air raid alerts, combat operations, and life in occupied territories of Ukraine. In a modern dictionary compiled by I.I. Prykhodko (2021) the term "stress" is defined as well as its kinds (combat, psychological, traumatic, physiological stress) and descriptions of stress behavior, types of stressors, and stress resistance are provided. Stress factors are any factors whose power of influence exceeds adaptive reactions of a body or system, but too much so as to cause lethal outcomes. The influence of such factors is facilitated by extreme living, learning or work conditions. Stress factors during distance learning in conditions of COVID-19 pandemics were analyzed in the article by H. Stelmashchuk (2021). During the recent years, the number of researches focusing on the interrelation between stress and schoolchildren's emotional well-being has increased in the scientific field. For example, M.E. Rodríguez-Rivas *et al.* (2023) analyzed the correlation between a stress condition and life satisfaction in teenage Chilean students during the period of distance learning. They have also established that the feeling of stress has a negative influence on life satisfaction. J. Guzmán *et al.* (2020) noted that schoolchildren's overall life satisfaction largely affects the relation between mental health risks and perception of academic and social functioning. Scientific research also indicates the importance of the role played by educational community in how teenage schoolchildren perceive the level of stress. In particular, A.W. Van Loon *et al.* (2020) emphasized that the school environment during classroom learning accompanied by various extracurricular and sporting events have a positive effect in reducing stress levels and ensure that schoolchildren have a higher level of well-being. C. Esposito *et al.* (2021) discovered that in the circumstances when usual personal communication was impossible, online communication filled the gap between peers and this considerably reduced the feeling of isolation and decreased manifestations of psychological stress. Support on the part of the educational institution, the teaching staff and classmates plays an important role in this process. In their research, M.D. Lyons & X. Jiang (2022) concluded that support from teachers and classmates has a positive influence on the quality of life and reduces the negative impact of stress on schoolchildren. G. Milas *et al.* (2021) suggested that in order to improve students' mental health, special preventive and educational programs should be applied to reduce stress levels.

The negative stress factors that influence schoolchildren's health considerably include bullying. The problem

of bullying has been concealed for a long time. The Constitution of Ukraine declares that the main rights of a person and citizen are the inalienable right to life, freedom and inviolability, respect of their honor and dignity (Constitution of Ukraine – Section II., n.d.). In this connection, a series of publications dedicated to this problem have appeared in the scientific environment. In particular, the bibliographical reference by N.L. Karpinska (2019) for head teachers, form teachers, subject teachers and teenagers reveals the essence of bullying and its types, causes and consequences. Also, this reference provides comprehensive information regarding policy of the state in protecting children and their rights. Considering pedagogical violence, scientists E. Matusov & P. Sullivan (2020) remarked that there are various forms of psychological and social violence that affect students' health, provoke physical, social and psychological pathologies, such forms being either a means of teaching or deliberate side effect of teaching that are used on a regular basis. It can be manifested as violent reactions from both students and teachers, and it can be directed against other learners or members of the teaching staff. In his article, R. Volosheniuk (2019) concludes that cyberbullying is a dangerous form of virtual aggression. In the study of bullying and teenage mental health, R. Ringdal *et al.* (2021) discovered that bullying is combined with decreasing levels of mental well-being and increasing symptoms of anxiety and depression. In exploration of bullying in a school environment, J.M. Aldridge *et al.* (2020) provided recommendations for school teachers on improving schoolchildren's mental health by ensuring their work in a favorable psychological and social school environment.

## MATERIALS AND METHODS

The research has been performed within the framework of the scientific topics of the Chair of Health and Life Safety at Hryhorii Skovoroda University in Pereiaslav, "Formation of health preservation competence in children, schoolchildren and university youth in the system of lifelong continuous education: medical-biological and psychological-pedagogical aspects". In the course of the research, the following theoretical methods were applied: analysis, synthesis, systematization, and generalization. With the use of these methods, the information available in scientific sources on stress factors of the educational process for schoolchildren was processed. The research was conducted in the period from December 2022 to February 2023 and involved 9<sup>th</sup> form students from gymnasiums (high schools) No.1 – No.5 located in Pereiaslav, Kyiv Region. School administrators agreed to participate in this research since they saw certain practical importance in it. Schoolchildren's parents also agreed on the students' participation in the research and the questionnaire survey for manifestations of stress. Therefore, the research was conducted with participation of gymnasium students, in the presence of gymnasium psychologists and with observance of the Helsinki Declaration (The Declaration of Helsinki, 2013). In order to identify presence of anxie-

ty, its causes and consequences for the studied schoolchildren, an anonymous questionnaire survey for their parents was organized as well. The questionnaire contained eight questions, where participants had to underline one answer:

- 1) Does your child often worry? (*Yes/No*);
- 2) Does your child often find it difficult to concentrate on doing their homework? (*Yes/No*);
- 3) Is your child often afraid of staying home alone? (*Yes/No*);
- 4) Does your child often find it difficult to calm down? (*Yes/No*);
- 5) Does your child have sleeping problems? (*Yes/No*);
- 6) Does your child have problems in communication with their peers? (*Yes/No*);
- 7) Does your child have problems in communication with their teachers? (*Yes/No*);
- 8) How often did you notice the following states in your child's mood over the last month: apathy, loneliness, sadness, anxiety, anger (*never; sometimes; 1-2 times; often or all the time*).

With the consent of gymnasiums' administrators, psychological testing was conducted among the studied schoolchildren. In particular, with the help of the Test for Determining Educational Stress by Yi. Shcherbatykh (n.d.) the main causes of stress and its manifestations in conditions of the educational process along with main techniques to cope with stress were identified. The studied schoolchildren answered four sets of questions seeking to reveal intellectual stress symptoms, behavioral stress symptoms, emotional symptoms, and physiological symptoms. Test results were assessed by the number of points scored: 0-5 points – stress is absent; 6-12 points – moderate stress; 13-24 points – quite prominent stress of emotional and physiological systems; 25-40 points – heavy stress; over 40 points – dangerous stress level – adaptation energy is exhausted. The obtained test results helped to identify special needs of the studied schoolchildren as regards psychological support, methodological means or other resources that facilitate stress reduction and improvement of the educational process (The Test for Determining..., n.d.). In order to identify the level of stress resistance and ability to counter the effects of stress factors, as well as to adapt to negative life circumstances, the test of stress resistance (The test of self-assessment..., n.d.) was used. The test consisted of 10 questions, and schoolchildren were suggested to underline one of the possible answers so as to assess their own reactions to stress situations. The final result was calculated by adding all points that the studied schoolchildren scored by answering the questions. Such self-assessment of their stress resistance helped the schoolchildren to get a better idea of their response to stress and overall stress resistance. The use of this test provided exhaustive information to develop strategies to handle stress and improve general well-being (The test of self-assessment..., n.d.). The test of resilience enabled the authors to characterize a person's ability to withstand a stress situation while maintaining inner

composure and preserving the current level of performance in typical activities. The studied schoolchildren were asked to respond to 45 statements by choosing one of the suggested answers. The resilience index was interpreted on the basis of the total amount of points scored by a participant (The test of resilience by S. Muddy (adapted by D.A. Leontiev and Ye. I. Raskazov), n.d.). The obtained empirical data was grouped and represented in diagrams and charts.

## RESULTS

Analyzing the classification of stress factors for modern schoolchildren in the educational environment should begin with such **factor as the war in Ukraine**. War will always be the destabilizing factor that always affects all people, especially schoolchildren, since education is the main aspect in a child's development. However, in conditions of the war, education faces numerous challenges that provoke emergence of stress factors for schoolchildren in the course of their studies: psychological pressure, physical danger, separation from their parents, lack of resources, social instability, and need for psychologic support. The stress factors affecting schoolchildren in combat areas or in occupied territories are many-valued and have a negative influence on both their psychological condition and academic performance. These include political instability, physical danger, social isolation, inaccessibility of education, and psychological stress. The stress factors for schoolchildren in captivity are a very threatening and stress-generating factor. It may occur when children are kidnapped, taken hostage, or are controlled by unknown (armed) persons against their will. As a result of possible physical and psychological torture in captivity, schoolchildren may develop long-term negative consequences for their mental and somatic health. Experience of being held in captivity may lead to separation of family members, and this can aggravate the feelings of fear, anxiety and helplessness, and cause emotional stress in schoolchildren. Usually, prisoners are deprived of access to basic needs (regular meals, pure drinking water, timely medical aid, proper education) which has an extremely negative impact on their mental and somatic health. Captive schoolchildren survive traumatic experiences consciously (bombardments, searches, pursuits, maltreatment etc) and it inadvertently affects their psychology. Permanent stress and instability cause psychological pressure on schoolchildren resulting in anxiety, depression and psychotraumas. Being in Russian captivity is an outrageous violation of Ukrainian children's rights: the rights to safety, education, and protection against violence and exploitation (Tovkun & Porhun, 2023).

The stress factors for schoolchildren attending schools in occupied territories include as follows: 1) lack of normal conditions for studying, as occupation causes a decrease in the quality of educational services. Due to limited opportunities and resources, schoolchildren develop anxiety and stress; 2) occupation always leads to *political pressure and indoctrination* (enforcement of a certain ideology and distortion of historical facts). Such actions affect

independence of thinking and psychological conditions of the underage; 3) occupation is the reason for *restricted access to any opportunities for development* (sports clubs, artistic and music activities, excursions), and all that has a negative impact on psychological health and social well-being of schoolchildren; 4) permanent *fear* of possible violence or conflict during the educational process leads to constant *anxiety* and post-traumatic stress disorder of students; 5) *social isolation* through occupation of schoolchildren arises feelings of loneliness and estrangement, for absence of connections with friends and relatives; 6) because of political pressure in occupation, *incorrect or modified information and teaching* are spreading, which change the children's worldview and exert a negative influence on their development; 7) conditions of occupation result in an increasing *risk of injury and violence* among schoolchildren (physical, emotional, verbal violence), which has a deteriorating impact on both their psychological condition and academic achievements; 8) occupation inevitably leads to *economic difficulties* for civil population (instability, reduced income, unemployment), which affects directly children's living conditions and health (Tovkun & Porhun, 2023).

Schoolchildren who survived combat operations, occupation, captivity or witnessed consequences of these atrocities may develop a post-traumatic stress disorder (nightmares, anxiety, permanent tension, reliving events of the past). As a result, they develop emotional problems (depression, anxiety, stress) that have a direct influence on their motivation to study, academic performance and health. This is why educational institutions have to provide schoolchildren with free access to psychologists or psychological services, psychologic support programs to help schoolchildren overcome stress and restore their psychological resilience (Where and how Ukrainian children..., 2022). At the same time, it is worth considering the stress factors of the educational process that emerge in normal peacetime conditions and still have a negative effect on schoolchildren's health.

**Academic factors.** Excessive amount of homework, various projects, tests and other academic requirements cause schoolchildren to become overloaded, which results in lack of time, poor homework preparation, and disruption of the day regimen. Exaggerated standards and expectations on the part of educators and parents exert nervous tension on schoolchildren; due to constant pressure for success, schoolchildren develop anxiety and stress. High requirements for compliance with deadlines and quality standards in performance of various research works create a permanently stressed environment for schoolchildren. Assessment and rating activities are another source of stress for students. Due to the fear of getting a bad mark, their self-esteem decreases, and a permanent state of anxiety develops. The competitive environment of an educational institution is always a source of stress, tension and anxiety (competing for higher marks, better positions, fear of falling behind or failing to live up to somebody's expectations). Regular tests and exams make schoolchildren feel fear and anxiety because of possible poor results. An unfavorable

academic environment – lack of support from teachers and classmates, poor learning conditions and inaccessibility of resources tend to increase the level of stress considerably (Ivantsanich, n.d.). Therefore, the abovementioned factors lead to overexerting mental resources, anxiety and development of continued stress conditions in schoolchildren. Due to an immense amount of academic work, schoolchildren have less and less time for recreation, entertainment and socializing, and this is going to affect their overall well-being and health at a later stage.

**Social factors.** Interpersonal relations (communication with peers and teachers) can also be a source of stress, since there are certain issues in establishing social connections and the feeling of being rejected by collective, which has a negative impact on schoolchildren's self-esteem and emotional state. Conflict situations involving peers or teachers (bullying, jealousy, competition, difference of opinions) provoke emergence of anxiety and stress in schoolchildren. The intensive pace of the educational process, steep demands, fear, failures caused by complicated / misunderstood teaching materials also cause stress conditions. A new social environment (admission to the first form, transition to the fifth or tenth form, or to another educational institution, any changes to the social surroundings) poses a complicated psychological challenge for schoolchildren, since they have to adapt to new conditions, collectives and relations. Family problems (parents' divorce, conflicts, financial difficulties, unemployment) have a negative impact on both the quality of life and mental health, thus triggering stress conditions. Being responsible for completion of assignments (projects, participation in activities, public speeches) is a powerful stress for most schoolchildren (Ivantsanich, n.d.). For students, their popularity among peers and compliance with the social standards ruling their environment is of utmost importance, and this is one of the factors to cause stress. Forms of social pressure include compliance with requirements to appearance, behavior, and academic performance. If schoolchildren feel they fail to comply with the standards as expected, this results in emergence of stress conditions. Such students develop low self-esteem, dissatisfaction with themselves, and their well-being deteriorates. In addition, everyday parental supervision of academic progress also facilitates development of anxiety. For this reason, schoolchildren develop the fear of failure to satisfy their parents' or teachers' expectations. It is this factor that boosts their stress and threatens their psychological well-being. Social factors also include family issues (parents' divorce, family conflicts, family violence, financial difficulties). Such atmosphere at home has a negative impact on schoolchildren's emotional state and causes a stress condition. Consequences typically include deteriorated behavior and academic performance. Financial crises in the family cause instability, dismay, worries and quarrels between parents. Children are usually very sensitive to such situations, since they feel it on their own (restrictions in satisfying new needs, receiving education, purchasing things, or food). Because of that, schoolchildren develop a negative

emotional state and lose their motivation to study. All these factors combined affect their memory, concentration, and ability to absorb new information.

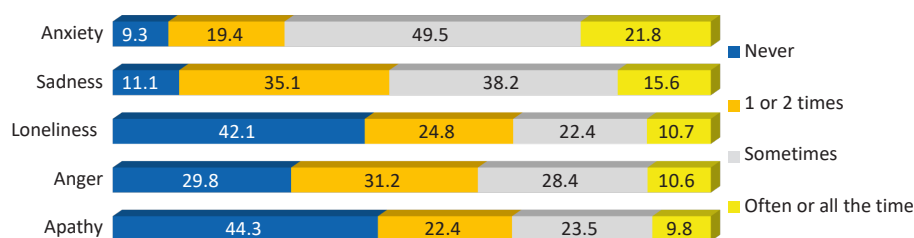
**Ecological factors.** Physical environment (incompliance with sanitary standards for classrooms or laboratories) can create a feeling of discomfort and cause negative consequences for schoolchildren's health. Loud noise in classrooms of educational institutions or in the playgrounds distracts schoolchildren's attention, reduces the period required for the fatigue to accumulate, and poses a serious hindrance to studies, while permanent noise causes annoyance and stress. Poor quality of air in classrooms of educational institutions (high level of CO<sub>2</sub>, allergic agents) affects proper functioning of the brain and respiratory system. Poor quality potable water and food at educational institutions cause discomfort and health problems. Dangerous routes from home to school and back, dangerous pedestrian crossings or their absence also provoke anxiety and stress in schoolchildren. Ecological disasters (all kinds of air or water pollution, natural disasters) exert a negative influence on schoolchildren's somatic and mental health.

**Psychological factors.** Low self-esteem and insecurity provoke development of stress. Children should be taught to set adequate standards for themselves to prevent them from worrying and regretting failures. High self-esteem is also a problem, since basing one's judgment on inadequate and excessive expectations also leads to stress, as the schoolchild fails to live up to their own standards. Perfectionism (inability to accept minor failures) provokes discontent and permanent stress. Fear of failure during studies can create permanent anxiety and stress conditions in schoolchildren. Adaptation to changes (fixed classroom-based system of learning, new teachers) also creates stress, especially in schoolchildren who are less communicative and find it more difficult to adapt to new conditions. Social ties (feeling of aloofness, problems in establishing social connections, conflicts with peers) excite feelings of isolation and permanent stress. Pressure from parents and teachers (excessive control, expecting excellent results) instill stress and anxiety in children's hearts. Emotional pressure is a schoolchild's collision with emotional problems: low self-esteem, problems with acquiring a proper status among peers, anxiety, and depressed mood. All of these have a negative impact on schoolchildren's psychological health and their academic achievements. In particular, students with low self-esteem always doubt their abilities and fail to believe in success of

any activity they may undertake. Schoolchildren suffering from bullying or social oppression tend to feel stress and anxiety within an educational institution. Such states affect their adaptation, education and academic achievements. Students subjected to permanent anxiety suffer from poor concentration, have problems with memorizing things and handling various tasks. Due to constant nervous tension, schoolchildren lose the opportunity to study well. Students who are in a state of depression have no interest in studies. Instead, they feel tired and exhausted all the time. Such conditions provoke academic motivation to disappear, which results in negative academic performance indicators.

**Physical stress** includes inadequate sleep during the day as compared to corresponding age-related standards, lack of physical activity, and availability of chronic diseases. All these factors have a negative influence on the energetic condition of schoolchildren, as well as on their concentration and health. For example, inadequate amount of daily sleep, improper nutrition and low motion activity cause development of fatigue and loss of energy. In its turn, this affects schoolchildren's concentration, their ability to listen carefully and quickly absorb new information. Irrational lifestyle and chronic diseases contribute to deterioration of schoolchildren's health. With all that, a schoolchild tends to lose their mood, and any willingness to participate in the life of the local educational community. A stress reaction caused by physical stress has a negative influence on their emotional state and ability to manage their own emotions. All these factors combined lead to reduced self-control, deteriorating mood, and increased anxiety levels. Based on a theoretical analysis of modern stress factors of the educational process and their effects on somatic and mental health of schoolchildren, an empirical research was conducted.

Since gymnasiums of Pereiaslav practiced distance learning throughout 2022-2023, only parents could provide exhaustive information regarding presence of anxiety symptoms in their children attending the gymnasiums. According to the **questionnaire survey**, most parents (68%) believed that their children had stress symptoms: often worried (48.2%), found it difficult to concentrate on doing their homework (39.4%), were afraid to stay home alone (27.3%), found it difficult to calm down (23.7%), had sleep problems (22.6%), has communication problems with peers (16.8%) and teachers (15.9%). From parents' evidence, we have established that the studied schoolchildren most often experienced anxiety and sadness, and least of all – apathy (Fig. 1).



**Figure 1.** How often did you notice these states in your child's mood over the last month? %

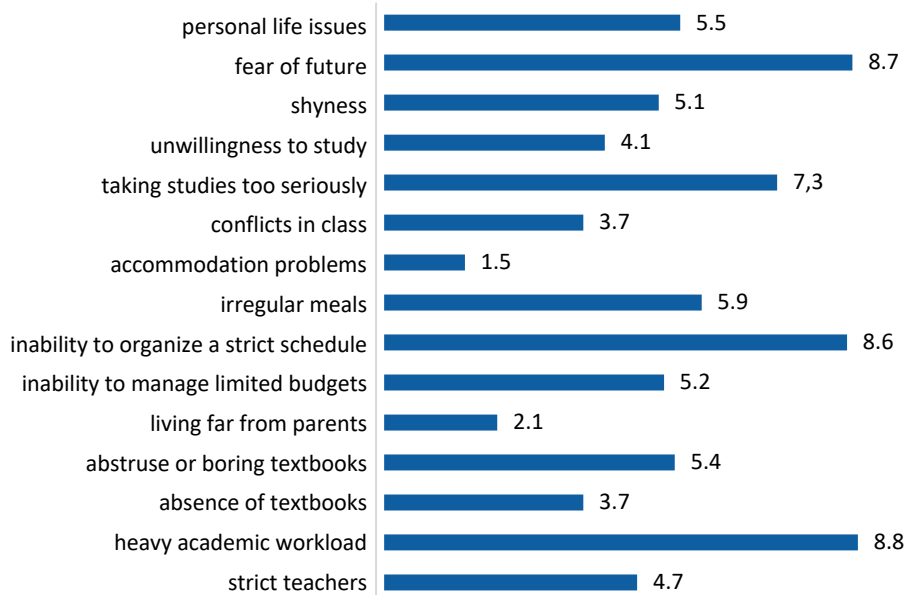
Source: developed by the authors

Academic stress is determined with the Test for Determining Academic Stress by Y.V. Shcherbatykh (n.d.) At first, average values for causes academic stress in the studied schoolchildren were found (Fig. 2).

Changes in the permanent stress level during December 2022, January and February 2023 are shown in Fig. 3.

Results of studies-related stress manifestation in studied schoolchildren are presented in Fig. 4.

To eliminate stress symptoms, the studied schoolchildren most frequently used such methods as communication with friends or a loved one, breaks from study, and sleep (Fig. 5).



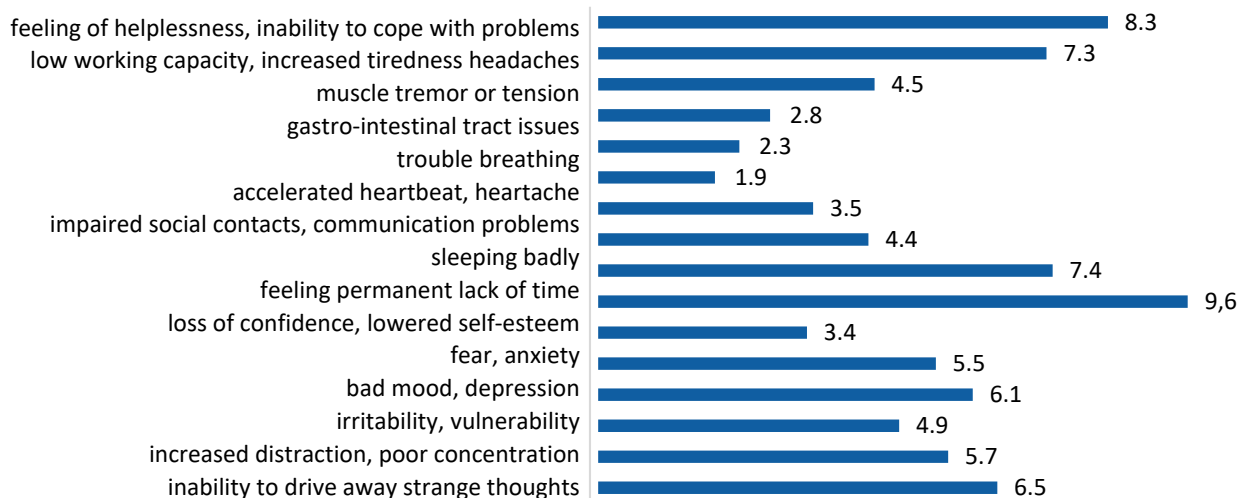
**Figure 2.** Causes of academic stress (average), %

**Source:** developed by the authors on the basis of the Test for Determining Academic Stress by Y.V. Shcherbatykh (n.d.)



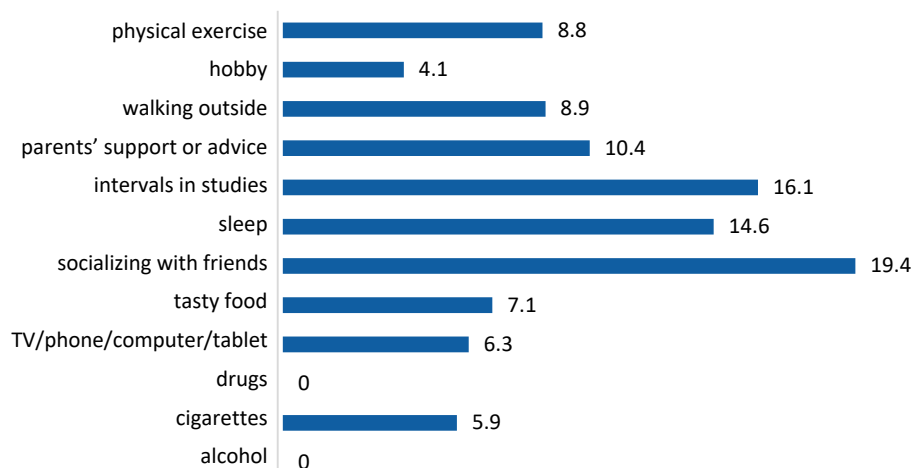
**Figure 3.** Changes in permanent stress level, December 2022, January and February 2023, %

**Source:** developed by the authors on the basis of the Test for Determining Academic Stress by Y.V. Shcherbatykh (n.d.)



**Figure 4.** Stress manifestation in studied schoolchildren (average), %

**Source:** developed by the authors on the basis of the Test for Determining Academic Stress by Y.V. Shcherbatykh (n.d.)



**Figure 5.** Methods used to eliminate stress symptoms, %

**Source:** developed by the authors on the basis of the Test for Determining Academic Stress by Y.V. Shcherbatykh (n.d.)

The level of anxiety in studied schoolchildren before tests is represented in points as follows: 1 point – 5.7%, 2 points – 5.3%, 3 points – 12.4%, 4 points – 2.8%, 5 points – 8.5%, 6 points – 14.2%, 7 points – 20.1%, 8 points – 12.6%, 9 points – 10.2%, 10 points – 8.2%. The studied schoolchildren indicated having such stress symptoms before tests: accelerated heartbeat – 39.2%, dry mouth – 16.4%, trouble breathing – 22.5%, headaches or other kinds of pain – 13.8%, muscle tremor or tension – 8.1%.

#### Determining stress resistance and resilience in senior schoolchildren.

As can be observed from results of the previous research to identify academic stress, educational process is exhausting for schoolchildren and is accompanied by a variety of stress conditions. That is why explorations of stress resistance and resilience of senior gymnasium schoolchildren in the circumstances of the war in Ukraine can help to improve support programs for overcoming stress, and enhance their abilities in securing success and overall psychological and physical well-being. Results of such explorations will help institutions of general secondary education to

understand the effects of war on schoolchildren's health better and develop effective measures to strengthen children's health and prevent psychosomatic disorders. Results obtained in application of S. Cowan and G. Williamson's self-assessment test of stress resistance enabled us to identify levels of stress resistance in the studied schoolchildren, how effectively they can cope with stress, and how well they can adapt to negative happenings in their lives. In particular, an excellent level of stress resistance is only found in 4.8% of the studied group, a good level – in 24.7%, a satisfactory level – in 28.8%, a poor level – in 33.2% and a very low level – in 8.5% of the participants.

S. Muddy's test of resilience (adapted by D.A. Leontiev and E.I. Raskazov) identified the ability of the studied schoolchildren to withstand a stress situation while maintaining inner composure and preserving the current level of performance in typical activities. For instance, a high level of resilience is found in 22.1%, a medium level – in 57.9% and a low level – in 20.0% of the studied group. Results of the studied children correspond to average and above average values of the resilience test, which indicates the distinctness of the measured factors. The data is presented in Table 1:

**Table 1.** Average figures for studied schoolchildren in the Test of Resilience, %

Involvement	Control	Risk acceptance	Resilience
35.2	29.4	17.8	84.4

**Source:** developed by the authors

Hence, according to the analysis of the classification of stress factors for schoolchildren in the educational environment, we have established that in wartime conditions, the educational process has to be adapted for the needs of schoolchildren who experienced, or are currently experiencing combat operations (by modifying curriculum, establishing a flexible class schedule, introducing distance or mixed learning pattern with safe conditions ensured). Stress factors related to being in a combat area, captivity or occupation suggest the need to apply required immediate action to ensure schoolchildren's safety, soonest

release and rehabilitation. Schoolchildren who experienced captivity or occupation require individual long-term psychological support, reintegration into the society, correction of the traumatic experience, and restoration of their mental health. The main step to eliminate the abovesaid stress factors is complete termination of war in Ukraine, immediate individual psychological support and social adaptation, along with provision of a safe educational environment for all schoolchildren. Reaction to academic stress is individual for every child: some of them cope faster with it, while others feel emotional discomfort for

a long time. In this relation, the following psychohygienic actions should be taken to reduce the effects of academic stress on schoolchildren: 1) develop and adhere to a rational day regimen and biorhythm-based principles of organizing the educational process; 2) ensure mutual support between classmates; 3) enable schoolchildren to cope with stress, use various relaxation techniques, meditations, and physical activities; 4) form a trusting interaction with teachers, practice repeated explanation of difficult topics if necessary; 5) provide timely psychologic support; 6) to relieve stress, use various relaxation methods, do sports or work out. It is worth remembering that a low level of stress during studies is a positive thing, since it stimulates students' productivity, while excessive stress (distress) means negative effects for all aspects of health and academic performance.

Knowledge of social and ecological stress factors enables adults (parents and teachers) to take certain actions to eliminate stress conditions and ensure favorable and trustful environment for comfortable studies. In this regard, it is also necessary to enable schoolchildren to express their emotions and report their problems in timely manner. Another important aspect is to support schoolchildren in their development of stress-handling skills. Schoolchildren should be taught to have their own opinions and be strong enough not to yield to wrong ideas from their surroundings. Parents and teachers need to support children and help them to overcome social pressure. In case of unfavorable family circumstances, teachers cannot treat schoolchildren contemptuously due to their poor academic results or behavior, but support them and express understanding. Psychologic counselling should be organized for both children and their parents. School psychologists need to develop a program of psychological support, conduct trainings on stress and emotional self-regulation, as well as control the psychological climate in classes where such children attend. To eliminate physical stress from schoolchildren's lives, they need to be taught healthy lifestyle habits. Educational institutions can use breaks for physical activities; introduce sensible nutrition menus in their canteens; organize events to promote healthy lifestyle among schoolchildren. Also, in order to reduce physical stress educational institutions can provide schoolchildren with free access to pure water, comfortable recreation areas or hygiene accommodations.

To reduce stress conditions in schoolchildren, it is worth doing the following: 1) encourage positive self-esteem and confidence, ability to accept failures and mistakes when studying; 2) teach schoolchildren to handle stress on their own; support each other; 3) provide an opportunity for schoolchildren to develop at their own pace, without pressure on the part of adults. This will reduce the level of stress and improve schoolchildren's psychological condition considerably. Therefore, the school period in a child's life can be accompanied with a number of stress factors in the educational environment, along with certain positive aspects. Results of this research have indicated the similarity of stress factors of the educational process which affect modern schoolchildren during the war in Ukraine. In

particular, conducting an anonymous questionnaire survey for the parents of the studied schoolchildren demonstrated directly that the children had a high level of anxiety in conditions of the full-scale war in Ukraine. Their parents noted that almost half of the studied children felt anxiety and sadness very often. This fact indicates that the studied schoolchildren have been found to experience a stress condition and a high level of anxiety in connection with the full-scale war. The main causes of academic stress in studied schoolchildren, according to the Test for Determining Academic Stress by Y.V. Shcherbatykh have been identified as follows: heavy academic workload – 8.8%; fear of future – 8.7%; inability to organize a strict schedule – 8.6% and too serious attitude to studies – 7.3%. These causes may provoke considerable deterioration of children's health and a decrease in the quality of their academic achievements.

The obtained results regarding changes in the permanent stress level experienced by the studied schoolchildren throughout December 2022, January and February 2023 indicate that the gymnasium students had a low level of stress resistance which affected their emotional state and caused inability to handle stress effectively. It is known that schoolchildren who lack the skills to control their own emotions and stress effectively are bound to face overload, lose concentration, and their academic performance will deteriorate soon. The main manifestations of stress have included: feeling permanent lack of time; feeling of helplessness, inability to cope with problems; sleeping badly; low working capacity, increased tiredness; inability to drive away strange thoughts and bad mood, depression. Permanent lack of time and feeling of helplessness indicate the state of being overloaded, inability to manage one's time effectively and handle problems. Experiencing bad sleep and low working capacity result from psychological tension which affects quality of sleep and overall level of energy. Inability to drive away strange thoughts indicates permanent absent-mindedness and concentration on negative factors. Bad mood and depression indicate one's inability to cope with stress effectively. Mostly, stress is still manifested on a psychological level, but with regular and prolonged exposure, its effects will begin to appear on a physiological level as well. From now on, the already available ailments should be considered closely: headaches (4.5%), accelerated heartbeat, heartache (3.5%), muscle tremor or tension (2.8%), gastro-intestinal tract issues (2.3%) and trouble breathing (1.9%). The most popular methods to overcome stress have become socializing with friends (19.4%), intervals in studies (16.1%) and sleep (14.6%). This is a good sign, since communication with friends provides support, distracts from stress situations, and gives a good opportunity to share feelings and receive advice or sympathy. Such social support also helps to reduce the stress level and improve mood. Such intervals in studies as short periods of rest or change of activity allow children to relax as well as renew their energy and reduce tension. Rest and recuperation through sound sleep promote stress reduction and general well-being improvement.

At the same time, it is a positive sign that the studied schoolchildren do not use alcohol and drugs to relieve stress. However, obviously following the example of their own parents or other adults, some of them have already started smoking to handle stress (5.9%). This fact should be paid attention to, and preventive action should be taken to eliminate this addiction. According to this test instructions, anxiety before tests assessed at 1 point (5.7%), 2 points (5.3%), 3 points (12.4%) and 4 points (2.8%) indicated good self-control and ability to withstand stress situation and maintain high level of concentration. According to the instruction, the average level of anxiety before tests is  $6.0 \pm 0.35$  points. Therefore, the studied schoolchildren who assessed their anxiety at 5 points (8.5%), 6 points (14.2%) and 7 points (20.1%) react to a stress situation in an emotional way, but they know how to control it. At the same time, they have low concentration and increased distraction levels. The abovementioned 8 points (12.6%), 9 points (10.2%) and 10 points (8.2%) indicate lack of self-control and lack of ability to overcome stress conditions. Before tests, the low level of worry has been found in 26.2% of the studied schoolchildren which indicates their relative calmness and confidence of their knowledge and proper revision for tests. The medium level of worry (42.8%) means that such children experience certain anxiety or partial lack of confidence as to their knowledge and skills. The high level of worry (31.0%) indicates a high degree of anxiety and stress, which has a negative impact on effectiveness and results of school tests. At the same time, it should be noted that worrying before tests is a normal reaction among schoolchildren. However, if such worries hinder studies, effective methods should be applied to reduce such emotions, or a psychologist should be consulted. All the abovementioned physiological reactions of children's bodies before tests indicate a physical and emotional response caused by nervousness, anxiety, and tension. For instance, accelerated heartbeat appears due to activation of the sympathetic nervous system. Dry mouth appears as a response to stimulation of the said sympathetic nervous system, which reduces saliva secretion. Trouble breathing is a manifestation of increased respiratory activity or changes in the breathing rhythm related to stress. Headaches or other pains as well as stiff muscles appear due to tension of muscles and corresponding systems of the human body during a stress reaction. Muscle tremor is another reaction to stress caused by reduction in muscle coordination or activation of the nervous system. These symptoms vary from human to human, so each person has their own reaction to stress.

Therefore, the obtained results of the test to determine academic stress have demonstrated that the educational process can have a great negative impact on the health and academic performance of schoolchildren. The low level of stress resistance causes emotional imbalance and makes it more complicated to manage stress effectively. Manifestations of stress may start to appear not only on psychological, but also on a physical level. Methods to overcome stress

are dominated by communication with friends, intervals in studies, and long periods of sleep. The studied schoolchildren do not use alcohol and drugs to relieve stress, but start smoking. A moderate level of worrying before tests is observed among the children, which is believed to be normal. Meanwhile, physiological symptoms indicate physical and emotional reaction of their bodies, including nervousness, anxiety and tension.

According to the results obtained with the test of self-assessment of stress resistance by S. Cohen and G. Williamson most of the studied schoolchildren (33.2%) have demonstrated poor and very low (8.5%) stress resistance levels, which can be related to the war in Ukraine and its effects on the civilian population. Only 4.8% of the studied children demonstrate a high level of stress resistance, which indicates their ability to overcome stress situations effectively in the present-day conditions. Satisfactory and good levels of stress resistance have been demonstrated by 28.8% and 24.7% of the children, respectively. Having summarized these results, we should note that excellent stress resistance is demonstrated only by 4.8%, satisfactory – by 53.5% and poor – by 41.7% of the studied children. Satisfactory stress resistance indicates that the children have sufficient resources to manage stress effectively. They usually react to complicated situations in a deeply emotional way, but then recuperate quickly and adapt to new conditions of their studies and social environment. Poor stress resistance indicates that the children have insufficient resources to manage stress, get adjusted easily, or concentrate on overcoming available difficulties. This situation has a direct influence on the quality of their studies, their feelings and overall well-being. In this connection, there is an urgent need to apply effective measures to bring stress resistance to a high level in conditions of the large-scale Russo-Ukrainian war in Ukraine. These measures may include: psychological support, trainings in stress management and development of personal skills that will help children overcome stress conditions more effectively and build up a positive base of resources.

According to the test of resilience by S. Muddy (adapted by D.A. Leontiev and Ye.I. Raskazov), the high level of resilience indicates that 22.1% of the studied schoolchildren have a high ability to overcome challenges of life effectively, counter stress and various difficulties, while continuing to grow and flourish. The medium level of resilience indicated that during the war 57.9% of the children are able to adapt to unfavorable conditions, live normal lives and continue their studies. Thanks to support from parents, teachers and peers they have both physical and emotional endurance and are able to withstand stress situations. At the same time, the medium level of resilience in wartime conditions of Ukraine may be different depending on the duration of combat operations in the vicinity of their habitation and on their access to educational institutions. The low level of resilience indicates that 20.0% of the studied children had lack of confidence, fear, anxiety, and feel potential threats to their safety. All these factors excite

negative feelings which affect their level of resilience. For this group, it is necessary to apply certain measures to protect their well-being and ensure proper accommodation and education conditions. Hence, results of the test of resilience by S. Muddy (adapted by D.A. Leontiev and Ye.I. Raskazov) give evidence to the distinctness of the measured indicators of the schoolchildren, and to their being dominated by medium-level resilience individuals.

## DISCUSSION

In their research A. Kadir *et al.* (2018) pointed out that wars or armed conflicts have a negative impact on overall health and behavior of schoolchildren in various age categories. Results of our research also indicate physical and emotional reaction of schoolchildren's bodies during the war in Ukraine, including nervousness, anxiety and tension. A similar opinion is expressed by G.J. Jucier *et al.* (2022): permanent combat operations threaten the health and lives of Ukraine's underage population. M. Mohseni *et al.* (2020) also emphasize that children's health has never improved but always deteriorated as a result of armed conflicts or wars. G.M. Danylenko *et al.* (2023), while studying mental state of internally displaced children in wartime conditions, also noted that in comparison with the prewar period, a third of children and teenagers faced deterioration of mental health, increased level of negative emotions, and suffered from headaches, dizziness, accelerated heartbeat, stomachache without obvious reasons, which indicates presence of a psychosomatic pathology. Results of this research has also found similar manifestations in the studied group: headaches, accelerated heartbeat, heartache, trouble breathing, muscle tension / tremor, gastro-intestinal tract issues. That is why, in order to improve stress resistance of Ukrainian schoolchildren in conditions of the large-scale Russo-Ukrainian war, effective action should be taken immediately: psychological support, trainings to develop skills to overcome stress conditions effectively etc. The same opinion is held by G. Milas *et al.* (2021), who suggest obligatory application of various specialized preventive and educational programs to reduce effectively the stress level among schoolchildren.

Teaching schoolchildren at institutions of comprehensive secondary education in the conditions of the Russo-Ukrainian war has a negative influence on their physical and mental health. It is closely connected with the effects of such negative stress factors as psychological stress, oversaturation with information, bullying, regular ailments, increased anxiety due to air raid alerts, combat operations, and life in occupied territories of Ukraine. In a modern dictionary compiled by I.I. Prykhodko (2021) the term "stress" is defined as well as its kinds (combat, psychological, traumatic, physiological stress) and descriptions of stress behavior, types of stressors, and stress resistance are provided. Stress factors are any factors whose power of influence exceeds adaptive reactions of a body or system, but too much so as to cause lethal outcomes. The influence of such factors is facilitated by extreme living, learning or

work conditions. Stress factors during distance learning in conditions of COVID-19 pandemics were analyzed in the article by H. Stelmashchuk (2021). During the recent years, the number of researches focusing on the interrelation between stress and schoolchildren's emotional well-being has increased in the scientific field. For example, M.E. Rodríguez-Rivas *et al.* (2023) analyzed the correlation between a stress condition and life satisfaction in teenage Chilean students during the period of distance learning. They have also established that the feeling of stress has a negative influence on life satisfaction. J. Guzmán *et al.* (2020) noted that schoolchildren's overall life satisfaction largely affects the relation between mental health risks and perception of academic and social functioning. Scientific research also indicates the importance of the role played by educational community in how teenage schoolchildren perceive the level of stress. In particular A.W. Van Loon *et al.* (2020) emphasized that the school environment during classroom learning accompanied by various extracurricular and sporting events have a positive effect in reducing stress levels and ensure that schoolchildren have a higher level of well-being. C. Esposito *et al.* (2021) discovered that in the circumstances when usual personal communication was impossible, online communication filled the gap between peers and this considerably reduced the feeling of isolation and decreased manifestations of psychological stress. Support on the part of the educational institution, the teaching staff and classmates plays an important role in this process. In their research M.D. Lyons & X. Jiang (2022) concluded that support from teachers and classmates has a positive influence on the quality of life and reduces the negative impact of stress on schoolchildren. G. Milas *et al.* (2021) pointed out that in order to improve young students' mental health, special preventive and educational programs should be applied to reduce stress levels.

The negative stress factors that influence schoolchildren's health considerably include bullying. The problem of bullying has been concealed for a long time. The Constitution of Ukraine declares that the main rights of a person and citizen are the inalienable right to life, freedom and inviolability, respect of their honor and dignity (Constitution of Ukraine – Section II., n.d.). In this connection, a series of publications dedicated to this problem have appeared in the scientific environment. In particular, the bibliographical reference by N.L. Karpinska (2019) for head teachers, form teachers, subject teachers and teenagers reveals the essence of bullying and its types, causes and consequences. Also, this reference provides comprehensive information regarding policy of the state in protecting children and their rights. Considering pedagogical violence, scientists E. Matusov & P. Sullivan (2020) remarked that there are various forms of psychological and social violence that affect students' health, provoke physical, social and psychological pathologies, such forms being either a means of teaching or deliberate side effect of teaching that are used on a regular basis. It can be manifested as violent reactions from both students and teachers, and it can be directed

against other learners or members of the teaching staff. In the corresponding article, R. Volosheniuk (2019) concludes that cyberbullying is a dangerous form of virtual aggression. In the study of bullying and teenage mental health, R. Ringdal *et al.* (2021) discovered that bullying is combined with decreasing levels of mental well-being and increasing symptoms of anxiety and depression. In exploration of bullying in a school environment, J.M. Aldridge *et al.* (2020) provided recommendations for school teachers on improving schoolchildren's mental health by ensuring their work in a favorable psychological and social school environment.

Therefore, summing up the abovesaid, in the conditions of the Russo-Ukrainian war it is important to take immediate action such as psychologic support and trainings in order to strengthen the stress resistance of Ukrainian schoolchildren. These research works also emphasize the significance of implementing preventive and educational programs intended to reduce schoolchildren's stress levels as well as prevent bullying.

## CONCLUSIONS

In connection with the full-scale Russo-Ukrainian war, the studied schoolchildren demonstrate all symptoms of stress condition and anxiety. Due to the importance of reducing the levels of anxiety and stress, it is necessary to take effective action for that purpose, as well as for ensuring their well-being in the realities of the current war. The causes of academic stress as identified above may provoke considerable deterioration of children's health and a decrease in the quality of their academic achievements. Low level of stress resistance affects their emotional state and inability to manage stress effectively. So far, stress is mostly manifested on a psychological level, but with regular and prolonged exposure, its effects will begin to appear on a physiological level as well. The most popular methods applied by schoolchildren to overcome stress are socializing with friends, taking breaks from studies, and sleeping. They do not use alcohol and drugs to relieve stress, but have begun to use

smoking for that purpose. Schoolchildren mostly experience medium level of worry before tests, which complies with general norms. The identified children's physiological reactions before tests indicate a physical and emotional response of their bodies caused by nervousness, anxiety, and tension.

The studied schoolchildren predominantly demonstrate satisfactory and poor stress resistance which indicates the corresponding unsatisfactory emotional state and poor ability to adapt to current wartime challenges and difficulties that they have to face both at home and at educational institutions on a daily basis. Stress resistance is an important skill that can be developed. For this purpose, trainings including relaxation and self-regulation techniques should be held, psychologic support should be provided, and positive surroundings created both at home and at educational institutions. The studied children mostly demonstrate a medium resilience level. It indicates that during the war, children are able to adapt to unfavorable conditions, live normal lives, and continue their studies, thanks to the support from their parents, teachers, and peers. Further research will consist in development and implementation of strategies, programs, complexes of training sessions, psychological recommendations that would be intended to manage stress conditions, form schoolchildren's stress resistance and resilience, which could greatly improve the quality of their studies, academic performance, somatic and psychological conditions. After all, it is by working hard to overcome stress at its early stages that secondary education applicants can receive an important tool to use throughout all of their lives while overcoming difficulties and achieving success.

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## CONFLICT OF INTEREST

None.

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## Оцінка впливу стресогенних факторів освітнього процесу на психосоматичне здоров'я школярів в умовах російсько-української війни

**Анотація.** В умовах повномасштабної російсько-української війни спостерігається зростання випадків депресії, апатії, тривоги і різних її розладів, а також інших психологічних проблем, що впливає на навчання і психосоматичне здоров'я школярів в Україні, що робить дану проблему важливою для вивчення. Метою дослідження було охарактеризувати види стресогенних факторів в освітньому середовищі та їх можливі наслідки впливу на організм школярів за умов мирного і воєнного часу; експериментальним шляхом оцінити реальний стан впливу шкільного стресу на психосоматичне здоров'я школярів. Теоретичний метод дав змогу проаналізувати, синтезувати, систематизувати й узагальнити наявну інформацію щодо стресогенних факторів освітнього процесу для школярів у науковій літературі. Експериментальне дослідження здійснювалося серед учнів гімназій міста Переяслава Київської області. Анонімне анкетування батьків використано для визначення наявності тривожності, причин виникнення та наслідків для досліджуваних. Серед досліджуваних гімназистів проводилися тестування на визначення навчального стресу, визначення самооцінки стресостійкості та життєстійкості. Встановлено, що освітнє середовище закладів освіти України в умовах війни характеризується появою низки стресогенних факторів. Досліджувані гімназисти мали високий рівень тривожності, низький рівень стресостійкості та середній рівень життєстійкості. Отримані результати тесту на визначення навчального стресу засвідчили те, що освітній процес має негативний вплив на стан здоров'я й академічну успішність школярів. Зростання стресогенних факторів під час широкомасштабної російсько-української війни негативно позначилося на психосоматичному здоров'ї, академічній успішності і соціальній адаптації школярів до навчання. Результати цього дослідження можуть бути використані для розробки та впровадження психопрофілактичних заходів, спрямованих на зменшення негативних стресових станів у школярів як у шкільному середовищі, так і в домашніх умовах, тим самим сприяючи створенню сприятливого психологічного середовища та благополуччя

**Ключові слова:** стрес; учні; стресостійкість; життєстійкість; тривожність; академічна успішність