Check for updates

DOI: https://doi.org/10.46502/issn.1856-7576/2024.18.04.14

Cómo citar:
Gubaryeva, O., Herasymchuk, T., Voronova, Y., & Yarmak, T. (2024). Methods for developing psychological resilience in engineering students under stressful conditions. *Revista Eduweb*, *18*(4), 205-218. https://doi.org/10.46502/issn.1856-7576/2024.18.04.14

Methods for developing psychological resilience in engineering students under stressful conditions

Métodos para desarrollar la resistencia psicológica en estudiantes de ingeniería bajo condiciones estresantes

Olga Gubaryeva
https://orcid.org/0000-0002-5303-674X
olgagubar@gmail.com
Candidate of Psychological Sciences, Associate Professor, Department of Philosophy and Pedagogy of Vocational Training, Kharkiv National Automobile and Highway University, Kharkiv, Ukraine.

Tetiana Herasymchuk
https://orcid.org/0000-0002-1952-4977
tetianapvl872@gmail.com
Candidate of Pedagogical Sciences, Associate Professor, Department of Philosophy and Pedagogy of Vocational Training, Kharkiv National Automobile and Highway University, Kharkiv, Ukraine.

Yelizaveta Voronova
https://orcid.org/0000-0001-9786-9906
volonovayel@gmail.com
Associate Professor, Department of Philosophy and Pedagogy of Vocational Training, Kharkiv National Automobile and Highway University, Kharkiv, Ukraine.

Tetiana Yarmak
https://orcid.org/0000-0003-4140-8283
tetyarmak@gmail.com
Candidate of Sociological Sciences, Associate Professor, Department of Philosophy and Pedagogy of Vocational Training, Kharkiv National Automobile and Highway University, Kharkiv, Ukraine.

Recibido: 20/10/24
Aceptado: 21/12/24

Abstract

This study focuses on the important topic of developing psychological resilience in students. The aim of the research is to explore methods for enhancing the psychological resilience of engineering students under stressful conditions. The following methods were used in the study: psychological diagnostics, quantitative, qualitative, and comparative data analysis, and modeling. Diagnostic indicators of psychological resilience include psychological resourcefulness, resilience, and stress tolerance. The study found that engineering students mostly showed low to medium levels in the analyzed parameters. Based on empirical data, a developmental and corrective program was designed to enhance the psychological resilience of students. The program includes various methods such as relaxation, meditation, breathing exercises, reframing, spiritual practices, sports activities, anxiety-reducing mobile apps, motivational videos, and more. These methods were implemented in group training sessions and other forms of group work with technical students. The results of this study can be used in higher education institutions to support the development of students' psychological resilience. Future

research will focus on creating recommendations for developing resilience in technical students under stressful conditions.

Keywords: emotions, mental state, psychological support, stress, students, technical specialties.

Resumen

Este estudio se centra en el importante tema del desarrollo de la resiliencia psicológica en los estudiantes. El objetivo de la investigación es explorar métodos para mejorar la resistencia psicológica de los estudiantes de ingeniería en condiciones de estrés. En el estudio se utilizaron los siguientes métodos: diagnóstico psicológico, análisis de datos cuantitativos, cualitativos y comparativos, y modelado. Los indicadores diagnósticos de la resiliencia psicológica incluyen el ingenio psicológico, la resiliencia y la tolerancia al estrés. El estudio encontró que los estudiantes de ingeniería mostraron niveles bajos a medios en los parámetros analizados. Sobre la base de datos empíricos, se diseñó un programa de desarrollo y corrección para mejorar la resiliencia psicológica de los estudiantes. El programa incluye varios métodos como relajación, meditación, ejercicios de respiración, reencuadramiento, prácticas espirituales, actividades deportivas, aplicaciones móviles para reducir la ansiedad, videos motivacionales y más. Estos métodos se aplicaron en sesiones de formación grupales y otras formas de trabajo en grupo con estudiantes técnicos. Los resultados de este estudio pueden utilizarse en instituciones de enseñanza superior para apoyar el desarrollo de la resistencia psicológica de los estudiantes. La investigación futura se centrará en crear recomendaciones para desarrollar la resiliencia en estudiantes técnicos bajo condiciones estresantes.

Palabras clave: emociones, estado mental, apoyo psicológico, estrés, estudiantes, especialidades técnicas.

Introduction

In modern conditions, individuals are exposed to significant negative impacts, which have destructive effects on their mental and emotional states. Ukrainians' psycho-emotional well-being during the war is affected by daily threats to life and health, the risk of losing loved ones, property, jobs, familiar social circles, and more. Many also suffer the effects of prolonged psychological trauma, loss, or grief. These conditions are especially destructive to individuals who are still developing, acquiring knowledge, and preparing for adult life, such as Ukrainian students. In the context of war, they are forced to study in various formats, change their usual means of communication, and, in some regions, even relocate. Constant threats to life and health, difficult tasks, and uncertainty significantly deplete students' psychological resources. Under such conditions, the need to develop psychological resilience becomes increasingly important. This is a crucial psychological phenomenon that affects a person's ability to withstand stress while maintaining mental health, which is essential for both personal life and academic and professional activities. Psychological resilience is developed and adjusted throughout life. Its indicators include a person's ability to control emotions and maintain normal psycho-emotional and physical states in stressful situations. Students are especially vulnerable to stress because their personalities are still forming. Therefore, the development of resilience in students under stress is an important task for psychological support. Despite a number of studies on the development of psychological resilience, there is a lack of practical solutions in the scientific literature. This highlights the direction of current research.

The importance of the study is undermined by the fact that Ukrainian students faced exceptionally stressful conditions in research and life in general. For more than 2 years, a full-scale military invasion of Ukraine has been going on, so students from 6 regions are generally deprived of the opportunity of full-time education, and different formats of education are combined in other regions of Ukraine. Over 131 professional-pedagogical and higher education institutions in Ukraine are significantly damaged or destroyed. Sixteen institutions of higher education were reloaded from the combat zone. Also, due to the war, thousands of students went abroad, and some continue to study in Ukraine online (Sharov, 2022). In addition, due to hostilities and forced migration, almost 24 thousand students did not resume their studies. Also, the learning conditions of international students in Ukraine have become more complicated, the

number of which reaches 50 thousand people and has decreased compared to the beginning of 2022 to 34 thousand (Rebryk, 2024).

Constant threats of missile and drone attacks will force Ukrainian students to be constantly distracted from learning in any format, to interrupt communication with teachers and the audience to go to safe places to shelter. Therefore, to adequately respond to these challenges, it is essential to form the psychological stability of students. We define the psychological resilience of students under stress as the ability of educational applicants to adapt to extreme circumstances, overcome anxiety, maintain emotional and psychological well-being, and support practical activities and training in war. In none of the countries of the world, there are no effective practices for preserving the psychological stability of students in war since there were such precedents. Therefore, our research should fill the gap regarding the preservation of the psychological stability of students in critical, highly stressful conditions. Several Ukrainian scientists have studied the psychological stability of personality (Moskalenets & Fedyk, 2024; Klochkov, 2022). They confirm its relevance and correlation with the psychological resources of the individual (Yena, 2024; Kostryba, & Lyashko, 2023). However, the duration of the above-mentioned stressful events necessitates further scientific research in this direction. It is also essential to search for effective practices and methods for the development of the psychological stability of students in stressful conditions.

Hypothesis: The use of well-selected methods of psychological support can enhance students' psychological resilience in stressful conditions. Objective: To identify methods for developing psychological resilience in engineering students under stressful conditions. Research tasks:

- Determine the current level of psychological resilience in engineering students;
- Develop programs to enhance psychological resilience in engineering students under stress;
- Test the effectiveness of the program;
- Assess the level of resilience achieved by the students.

Literature Review

Scientists describe the impact of stress on the mental health of student youth as one of the most destructive consequences of war. This influence negatively affects students' physical health parameters, depriving them of opportunities for development and essential resources. In this context, psychological resilience becomes crucial. It is viewed as resistance to stress, a safeguard against disorientation and various disorders, and a foundation for inner harmony, full mental health, and high productivity (Dekusar & Davidova, 2024). Psychological resilience is considered a dynamic component of personality structure. It enables individuals to withstand extreme situations, life difficulties, and adverse conditions while maintaining physical and mental health, as well as performance (Klochkov, 2022). Scientists emphasize the particular vulnerability of student youth to the intense destructive impact of war-related stressors on their psyche (Moskalenets & Fedyk, 2024). Psychological resilience, which is influenced by both genetically determined and psychological components of personality, is essential for countering this influence (Kostryba & Lyashko, 2023). The development of psychological resilience is achieved by forming a psychological resource within the individual (Yena, 2024).

Scientific studies highlight the negative impact of stress factors on students' mental health and emphasize the need to seek and implement new activities (Zhang, et al., 2022). These may include various types of sports, scientific, and artistic activities (Al-Rousan et al., 2023). Researchers stress the importance of social support for higher education students to preserve their mental health under stress (Pasinringi et al., 2022). Empirical studies conducted among students revealed a tendency toward increased depression, anxiety, acute stress symptoms, and neurotic disorders among students during the prolonged war in Ukraine (Mykhaylyshyn et al., 2024). Indicators of mental instability in students under stress include reduced emotional well-being and inappropriate reactions to environmental stressors (Yunusovich et al., 2022). Stress also has a destructive impact on students' academic self-efficacy, highlighting the need for a healthy atmosphere to support their future development (Liu et al., 2024). Therefore, authors of empirical studies emphasize the importance of mitigating the effects of students' emotional disorders through the

implementation of corrective physical activities (Byshevets et al., 2024). It is also crucial to develop personal adaptation potential, the ability to devise stress-coping strategies, and improve students' subjective psychological well-being (Babakhova et al., 2023).

Numerous studies demonstrate a correlation between stress and poor mental well-being in students, confirmed by the global scientific community during the COVID-19 pandemic (Barbayannis et al., 2022; Fang et al., 2022). This underscores the importance of further research into the academic and social factors contributing to the development of anxiety and depressive disorders in students under stress (Limone & Toto, 2022). In this context, reducing stress levels, increasing the educational influence on students, maintaining a positive family environment, fostering a supportive social atmosphere, and providing psychological counseling are critical (Fan et al., 2024). Research also confirms the positive influence of psychosocial resources on the development of students' psychological resilience (Kee-Jiar & Chia-Keat, 2020). Individual factors (resilience and positivity) and socio-environmental factors (social support and nationality) are identified as resources that reduce perceived stress levels among university students (Litwic-Kaminska et al., 2023). Reducing stress is seen as a tool to protect students' mental health from negative influences (Slimmen et al., 2022).

Stress in students correlates with anxiety, as confirmed by physiological indicators such as increased heart rate and cortisol secretion (Wang et al., 2024). Stress also affects students' academic self-efficacy (Kristensen et al., 2023) and is a factor in their psychological well-being (Feng et al., 2024; Makhubela, 2022). To overcome stress, students need to develop psychological resilience (Theron et al., 2022; Sarbassova et al., 2024). This is confirmed by research on the psychogenic impact of extreme situations on an individual's stress resilience. Psychological resilience depends on individual personality traits (self-regulation, self-control, emotional stability, and emotional intelligence) and facilitates adaptation to environmental conditions while mitigating their negative effects (Spytska, 2024). During the external migration of Ukrainian students amid the war, the influence of cultural stress also increases, triggering symptoms of depression, anxiety, and behavioral deviations (Schwartz et al., 2024). Amid negative social challenges, the issue of psychological resilience is relevant not only for students but also for teachers. One way for teachers to address this situation is through self-development, experience exchange, and participation in consulting programs (Igar, 2024). Psychological support for students in stressful conditions should include optimizing personal psychological resources for successfully overcoming stress. It should also focus on minimizing the negative effects of stress and developing strong methods of defensive behavior and coping (Kundii et al., 2024). Methods for developing students' psychological resilience in stressful conditions include group sessions, training, and teaching relaxation techniques, stress management, positive thinking, and other psychological strategies (Yena, 2024).

Overall, scientific research emphasizes the importance of developing students' psychological resilience. Significant attention is also given to the impact of stress factors on students' mental health. However, most studies focus on the influence of stress factors on individual psychological resilience. At the same time, the issue of finding effective methods for developing students' psychological resilience in modern stressful conditions remains less explored. Therefore, there is a need for empirical verification of methods for developing students' psychological resilience under stress.

Methods

Research Procedure

The study on the development of psychological resilience in students of engineering disciplines consisted of four stages. In the first stage (organizational), a sample was formed, and psychodiagnostic tools were selected. During the second stage (diagnostic), psychological testing was conducted. In the third stage (developmental), a program to enhance students' psychological resilience in stressful conditions was developed and tested. The fourth stage (final) involved retesting the respondents, interpreting and comparing the obtained data, and drawing conclusions. The study was conducted from December 2023 to

September 2024: December 2023 – organizational and diagnostic stages; January to June 2024 – developmental stage; September 2024 – final stage.

Sample Formation

The study on the development of psychological resilience in engineering students was conducted at the Department of Philosophy and Pedagogy of Professional Training at the Faculty of Transport Systems of Kharkiv National Automobile and Highway University. The study covered 175 first- to fourth-year students (1st year – 40 students, 2nd year – 50 students, 3rd year – 45 students, 4th year – 40 students). Personal data of the respondents were kept confidential, making the survey anonymous. The use of valid psychodiagnostic methods ensured objectivity in conducting the survey. During the formation of the sample, the goal was to include as many engineering students from all years of study as possible to track the dynamics of changes in psychological resilience under stressful conditions at each year of study. This approach also allowed for considering the impact of the psychological work carried out with the students to improve their resilience in stressful conditions. The sample size was sufficient for the study, as it included the majority of students from the analyzed disciplines. The surveys were conducted by practical psychologists.

Methods

The following methods were chosen to study the level of psychological resilience in engineering students:

Psychodiagnostic methods: O.S. Shtepa's "Personality Resourcefulness Questionnaire," (Shtepa, 2018);
the "Connor-Davidson Resilience Scale" (CD-RISC-10), modified by L. Campbell-Sills and M.B. Stein (Shkolina, et al., 2020);
T. Holmes and R. Rahe's "Stress Resistance and Social Adaptation" test (Holmes, & Rahe,1967);
qualitative analysis of psychodiagnostic data.

Ukrainian researchers developed and successfully tested the questionnaire on the psychological resourcefulness of O.S. Shtepa (Shtepa, 2018). The methodology consists of 67 statements that involve the expression of consent or disagreement by the respondents. The method has been successfully validated, particularly the value. In particular, the Cronbach α is > 0.7. The methodology provides answers to questions on several scales: self-confidence, kindness to people, helping others, success, love, openness to relationships and life, creativity, faith in goodness, desire for wisdom, work on oneself, self-realization in the profession, responsibility, knowledge of one's psychological resources, ability to update one's psychological resources, independently overcome challenging life situations. According to this technique, the individual's general level of psychological resourcefulness is also recognized.

"Resistance Scale" by K. Connor-D. Davidson, modified by L. Campbell-Seals and M. Stein (L. Campbell-Sills, M. B. Stein CD-RISC-10), contains 10 statements assessing a person's ability to adapt to stressful situations, overcome difficulties and recover from them. Respondents are asked to rate ten statements on a scale from 0 to 4 points, where 0 - "completely disagree" and 4 - "completely agree." The scale measures the following key components of resistance: stress resistance, the ability to control the situation, self-confidence, and the ability to recover from difficult circumstances quickly. The technique allows you to establish high, medium and low resistance levels. With a high level of resistance, the individual has a pronounced psychological stability and the ability to adapt to life's challenges effectively. A person with an average level of resiliency has the potential to develop resilience further. Still, with a low level, they have difficulties in confronting stress and the need for additional support and resources. Resistance scale by K. Connor-D. Davidson was modified by L. Campbell-Seals and M. Stein and adapted by Ukrainian scientists (Shkolina et al., 2020). Studies have confirmed the reliability of the Ukrainian version of this technique by alpha-Cronbach 0, 755 results.

The study used the original method, "Determination of stress resistance and social adaptation" by T. Holmes, R. Rage (Holmes & Rahe, 1967). It consists of 43 life events, each with a specific weight coefficient of stress,

expressed in points. Examples of such events are marriage, divorce, death of a loved one, change of workplace, etc. The respondent analyzes the list of events and notes those that happened to him during the last year. After that, the total number of points is calculated, and the corresponding stress resistance and social adaptation levels are determined: high, marginal, and low.

Results

The basis for the formation of personal psychological resilience is psychological resources. The average data obtained at the diagnostic stage of the study, based on O.S. Shtepa's "Personality Psychological Resources Questionnaire," are presented in Table 1.

Table 1.
Summary Data on the Level of Psychological Resources Among Engineering Students in 1st to 4th Years, %

Level of Psychological Resources	1st Year	2nd Year	3rd Year	4th Year	Average Indicator
High	12.5	20	35.6	50	29.5
Medium	37.5	40	42.2	30	37.4
Low	50	40	22.2	20	33.1

Source: compiled by the authors based on the conducted research

Based on the data in Table 1, it can be stated that most respondents have an average level of personal psychological resources. The highest levels of psychological resources are recorded in the third and fourth years of study. This can be explained by the increased adaptability of engineering students to life and study in stressful conditions (changing study formats, interruptions due to mass missile strikes, problems with energy supplies and the internet, etc.). The lowest levels of psychological resources are found among first- and second-year students. This is associated with their lower adaptation to studying and living under constant stress and psychological trauma. Low levels of personal psychological resources indicate insufficient capacity for developing psychological resilience in stressful conditions. We also analyzed personal psychological resource indicators across all subscales of O.S. Shtepa's "Personality Psychological Resources Questionnaire." The data are presented in Table 2.

Table 2.
Indicators of Psychological Resources Among Engineering Students in 1st to 4th Years, % by Subscale

Subscale	% respondents				Average Indicator
	1st Year	2nd Year	3rd Year	4th Year	
1. Self-confidence	12.5	16	22.2	50	25.2
2. Kindness towards others	5	4	13.3	20	10.6
3. Helping others	17.5	16	17.8	20	17.8
4. Success	5	12	22.2	35	18.6
5. Love	15	16	15.6	25	17.9
6. Creativity	2.5	4	17.8	37.5	15.4
7. Faith in goodness	2.5	4	13.3	20	10.0
8. Aspiration for wisdom	2.5	4	11.1	25	10.7
9. Self-development	10	20	28.9	45	26.0
10. Professional selfrealization	5	16	31.1	47.5	24.9
11. Responsibility	10	16	22.2	55	25.8
12. Awareness of one's own psychological resources	2.5	12	26.7	50	22.8
13. Ability to renew one's psychological resources	5	16	24.4	45	22.6
14. Ability to manage one's psychological resources	2.5	14	17.8	40	18.6

Source: compiled by the authors based on the conducted research

As shown in Table 2, engineering students demonstrated the highest psychological resource indicators across four subscales: self-development (26%), responsibility (25.8%), self-confidence (25.2%), and professional self-realization (24.9%). Slightly lower indicators were recorded for awareness of one's own psychological resources (22.8%), the ability to renew them (22.6%), the ability to manage them (18.6%), success (18.6%), love (17.9%), and helping others (17.8%). The lowest indicators of psychological resources were found in the subscales: faith in goodness (10%), aspiration for wisdom (10.7%), kindness towards others (10.6%), and creativity (15.4%). This suggests that students are capable of self-development and have a responsible attitude towards themselves and life. Respondents are confident in themselves and already feel professionally self-realized at the stage of study. However, they exhibit less kindness towards others, a desire for wise decisions, and creative activity. Within the empirical study, we diagnosed the resilience of individuals, i.e., their resistance to stress factors. The diagnostic results are presented in Figure 1.

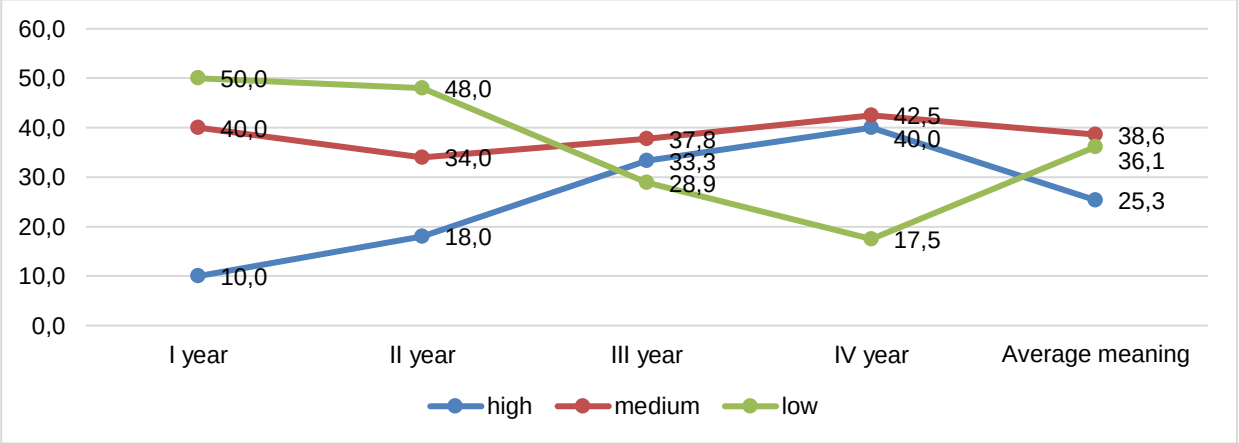

Figure 1. Levels of Resilience Among Engineering Students in 1st to 4th Years, %
Source: compiled by the authors based on the conducted research

Empirical data (Figure 1) indicate an average level of resilience in most of the surveyed students. A significant portion consists of students with low resilience, indicating major difficulties in developing psychological resilience under stress. The lowest indicators of this parameter were recorded among first- and second-year students. This suggests a low ability among these students to cope with stress while maintaining a normal mental state and capacity for learning. However, the indicators are higher for third- and fourth-year students compared to younger students. This indicates that these students can counter stress by utilizing their internal psychological resources, maintaining stable psycho-emotional states, and productivity.

The ability to resist stress reflects personal psychological resilience and the potential for its further development and enhancement. The empirical data obtained using the Holmes and Rahe Stress Resistance and Social Adaptation Scale are summarized in Figure 2.

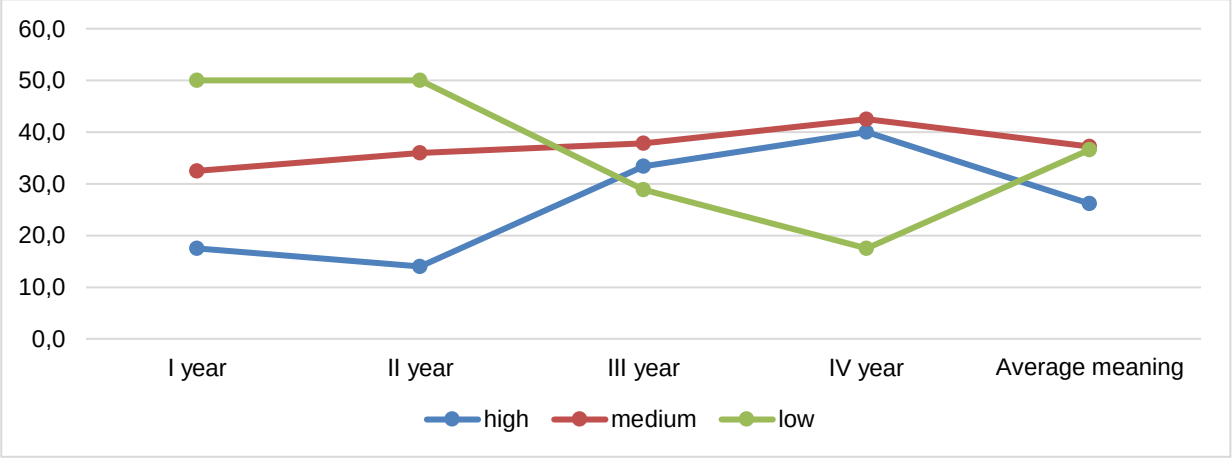

Figure 2. Degree of Stress Resistance Among Engineering Students in 1st to 4th Years, %
Source: compiled by the authors based on the conducted research

Empirical data (Figure 2) show that most of the sample consists of students with a low level of stress resistance, indicating significant problems in the development of psychological resilience in stressful conditions.

As part of the study, we proposed a program to develop psychological resilience among students in stressful conditions. Its goal is to form and adjust personal psychological resilience.

The objectives of the program for the development of psychological resilience among technical students include adjusting students' stress resistance, enhancing personal psychological resources, and adjusting student resilience.

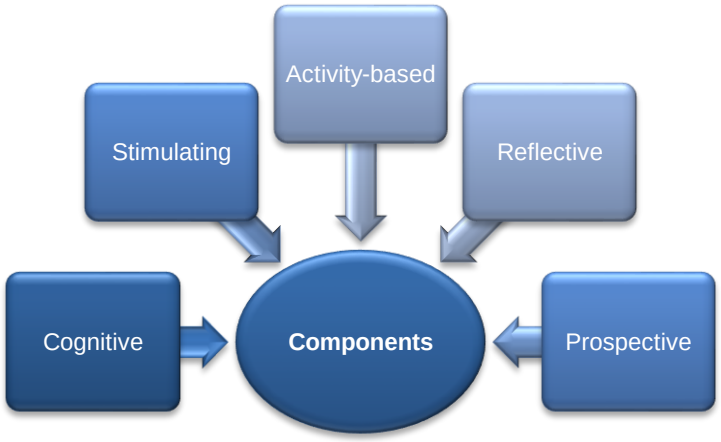

Figure 3. Structure of the Developmental-Corrective Program for Enhancing Psychological Resilience among Technical Students in Stressful Conditions.
Source: Compiled by the authors based on the conducted research.

The program for developing psychological resilience in technical students consists of cognitive, stimulating, active, reflective, and prospective components (Figure 3). The cognitive component aims to expand the cognitive domain of students, deepening their knowledge of psychological resilience in stressful conditions. The goal of the stimulating component is to motivate students to activate their own psychological resources in stressful situations. The active component is designed to form an objective understanding of one's own

level of psychological resilience. The reflective component focuses on comparing students' current and required levels of psychological resilience. The prospective component is aimed at planning further activities to develop psychological resilience among students.

To enhance the psychological resilience of technical students, we proposed the following methods within the program: psychological exercises; breathing exercises; autogenic training; relaxation; art therapy; humor; "havening" (safe zone); reframing; mindfulness; gratitude practices; working with web services to reduce anxiety and emotional tension; spiritual practices; creative activities; and creating motivational videos. Based on the aforementioned methods, we have developed a series of activities for the developmental-corrective program. The themes of these activities are presented in Table 3.

Table 3.
Themes of Activities in the Developmental-Corrective Program for Enhancing Psychological Resilience among Technical Students

No.	Theme	Methods	Form of Conduct
1	How to Cope with Stress	Psychological exercises, autogenic training, breathing exercises	Group discussion
2	Adjusting Psycho-Emotional State	Psychological exercises, relaxation, meditation, reframing	Psychological training with elements of reframing
3	Ways to Counteract Stress	Art therapy, creative exercises, humorous stories, "havening"	Group discussion with elements of storytelling
4	Stress and Digitalization	Meditation, mindfulness, analysis of spiritual practices, working with web applications to reduce anxiety (Svitlo, Mindshift, Booster Buddy, Daylio, Drug. First Aid)	Psychological training
5	Psychological Resilience and War	Training, physical exercises, gymnastics, creating motivational videos, relaxation exercises, gratitude practices	Sports-relaxation competition
6	How to Become a Psychologically Resilient Person	Autogenic training, meditation, creative exercises	Group discussion with elements of storytelling
7	My Psychological Resource	Art therapy, creative exercises, humorous stories, reframing	Psychological training
8	My Action Plan in Stress	Meditation, creative exercises, projective exercises	Group discussion with elements of storytelling

Source: Compiled by the authors based on the conducted research.

The described program was implemented in the psychological support system for technical students of all academic years during the formative stage of the research. It was carried out during the II semester of the 2023/2024 academic year. After the experimental testing of the program we developed, a repeat psychodiagnosis was conducted at the final stage of the research using the same methods as in the initial stage. Based on the obtained data, a comparative analysis of the data from the initial and final stages of the research was performed. The comparison was based on the averaged data obtained. The results are presented below (Fig. 4).

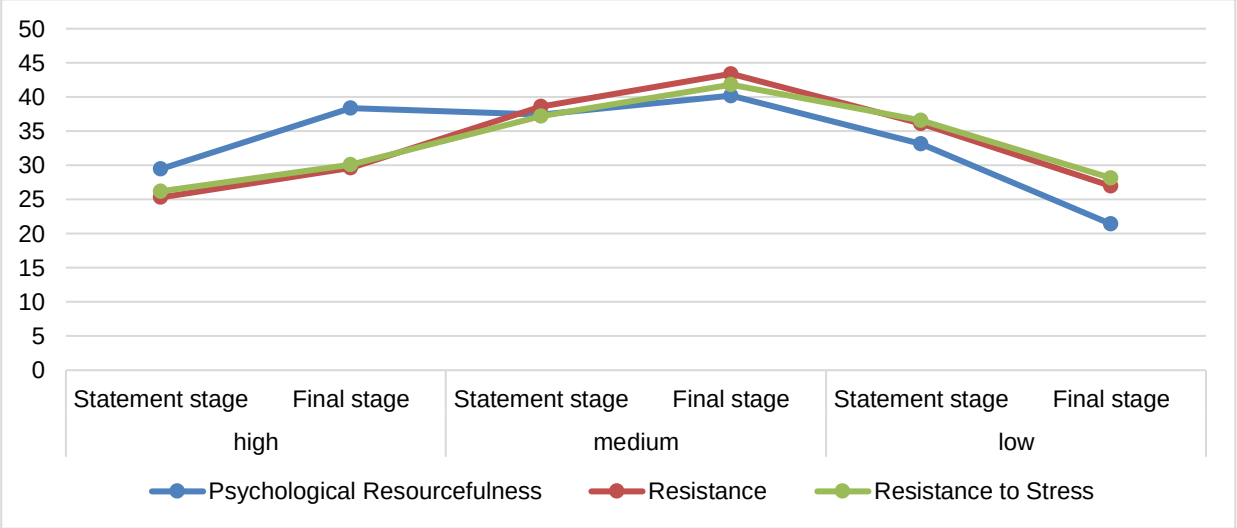

Figure 4. Comparative Analysis of Psychological Resilience Indicators among Engineering Students in the 1st-4th Years at the Initial and Final Stages of the Research, %
Source: Compiled by the authors based on the conducted research

From Figure 4, it is evident that at the final stage of the research, compared to the initial stage, there was an increase in all indicators of psychological resilience: psychological resourcefulness, resilience, and stress resistance. At the final stage, there was a recorded increase in the number of respondents with high psychological resourcefulness (by 8.9%) and with average levels (by 2.8%). Additionally, an increase was noted in the number of respondents with high resilience (by 4.3%) and average levels of this parameter (by 5.8%). The number of respondents with high stress resistance increased by 4.9% at the final stage compared to the initial stage, while those with average levels increased by 5.6%. At the same time, there was a proportional decrease in the number of subjects with low indicators across all analyzed parameters of psychological resilience. This indicates the effectiveness of the proposed developmental-corrective program.

Discussion

In the scholarly works related to our research, the importance of forming psychological resilience in students under stress is emphasized (Dekusar & Davidova, 2024; Moskalenets & Fedyk, 2024). It is also noted that students are particularly susceptible to stress situations, which negatively impacts their overall mental health (Zhang et al., 2022). The authors of empirical studies confirm the positive influence of various activities on the development of psychological resilience among students, including physical, creative, spiritual, and social practices (Al-Rousan et al., 2023; Pasinringi et al., 2022). Similar studies highlight the importance of utilizing personal psychological resources to foster resilience and increase stress resistance (Babakhova et al., 2023). In the context of our research, the approach concerning the use of group work forms, particularly psychotherapeutic sessions, deserves attention (Yena, 2024). We also share the opinion of other researchers regarding the appropriateness of using creative exercises, relaxation, meditation, reframing, and daily routines as methods for developing students' psychological resilience.

Our research stands out for its comprehensive approach to assessing the main correlates of psychological resilience: psychological resourcefulness, resilience, and stress resistance. It is precisely the psychological resource of a person that enables them to form an adequate response to stressful situations. Resilience helps maintain the stability of students' psycho-emotional state under stress and their normal level of productivity. Stress resistance equips students with the ability to counteract stressors and resist their influence. This is particularly important in conditions of chronic stress and prolonged trauma that Ukrainian students are currently experiencing (Kostryba & Lyashko, 2023).

Summarizing the results of our research, we can fully agree with other researchers regarding the priorities for developing psychological resilience in students under stress. However, unlike the studies we described, recent scientific explorations highlight the COVID-19 pandemic as a primary stress condition for students (Barbayannis et al., 2022; Fang et al., 2022). The main challenge and provoking factor during this period was the social isolation of students and the shift from face-to-face communication to virtual formats. However, the challenges faced by Ukrainian students during wartime encompass not only social distancing but also constant existential threats, experiences of psychological trauma, loss, and grief, as well as the disruption of their usual way of life. These represent significantly more complex challenges in terms of developing and maintaining psychological resilience under stress. Therefore, the primary advantage of our research is its consideration of the stress factors of wartime in the diagnostic and developmental-corrective work concerning the enhancement of students' psychological resilience.

Our research is significant due to the potential to address the existing issues within psychological communities in higher education institutions regarding the formation of students' psychological resilience under stressful conditions. The research aligns with the stated goal, as suitable methods for developing psychological resilience in students under stress have been identified and tested. These methods can be utilized by practical psychologists working with students exhibiting low levels of psychological resilience.

Limitations

The main limitations of the research pertain to its execution among students in technical specialties at the Department of Philosophy and Pedagogy of Professional Training at the Faculty of Transport Systems of Kharkiv National Automobile and Highway University. Although the issue of developing psychological resilience in students is relevant to the entire system of higher education institutions in Ukraine.

Recommendations

The primary recommendations include expanding the research sample by including students from various fields of study across diverse higher education institutions in Ukraine.

Conclusions

The study covers the relevant topic of developing psychological resilience among students in stressful conditions. The conducted empirical research established a predominance of respondents among technical students with an average level of psychological resourcefulness and low levels of resilience and stress resistance. The lowest indicators were demonstrated by younger students, while the highest were shown by older students. Specifically, 29.5% of respondents exhibited high levels, 37.4% medium levels, and 33.1% low levels of psychological resourcefulness. Additionally, an average of 25.3% of students displayed high levels, 38.6% medium levels, and 36.1% low levels of personal resilience. Moreover, 26.2% of students exhibited high levels, 37.3% medium levels, and 36.6% low levels of stress resistance.

To foster psychological resilience among students in technical specialties, a developmental-corrective program has been proposed. The program incorporates cognitive, stimulating, activity-based, reflective, and prospective components. Within the program, methods for developing students' psychological resilience are suggested, including psychological, breathing, relaxation, art therapy, creative exercises, humor, "havening," reframing, mindfulness, web services, spiritual practices, and motivational videos. The program includes group discussions, sports-relaxation competitions, and psychological training sessions. The follow-up psychological reassessment conducted after the experimental implementation of the developmental-corrective program confirmed the growth of all psychological resilience indicators among students. There was an increase in the number of students with high (by 8.9%) and medium (by 2.8%) levels of psychological resourcefulness. The number of students exhibiting high (by 4.3%) and medium (by 5.8%) levels of personal resilience also increased, as did those with high (by 4.9%) and medium (by 5.6%) levels of stress resistance.

This attests to the effectiveness of our proposed approach to the psychological support of developing psychological resilience among students in technical fields under stress. It also confirms the hypothesis that using well-selected methods of psychological support contributes to enhancing students' psychological resilience in stressful conditions. The results of the study can be utilized in the psychological support systems for developing the psychological resilience of students in higher education institutions in Ukraine amidst stress-related challenges. Future research could focus on developing recommendations for enhancing psychological resilience among students from various disciplines under stress.

Bibliographic references

Al-Rousan, A. H., Ayasrah, M. N., & Khasawneh, M. A. S. (2023). Psychological stability and its relationship to academic performance among secondary school students. *Journal of Information Sciences Letters*, *12*(3), 1469-1478. https://www.naturalspublishing.com/files/published/m82768n518oyi9.pdf

Babakhova, L. G., Khachaturyan, N. N., & Lomova, N. V. (2023). Psychological well-being of students in digital educational environment. *E3S Web of Conferences, 389*, 08014. https://doi.org/10.1051/e3sconf/202338908014

Barbayannis, G., Bandari, M., Zheng, X., Baquerizo, H., Pecor, K., & Ming, X. (2022). Academic stress and mental well-being in college students: Correlations, affected groups, and COVID-19. *Frontiers in Psychology,* 13, 1-10. https://doi.org/10.3389/fpsyg.2022.886344

Byshevets, N., Andrieieva, O., Pasichniak, L., Goncharova, N., Yarmak, O., Zakharina, I., & Blystiv, T. (2024). Evaluation of emotional disorder risk in students with low physical activity levels under stressful conditions. *Journal of Physical Education and Sport*, *24*(4), 894-904. https://doi.org/10.7752/jpes.2024.04102

Dekusar, H., & Davidova, N. (2024). Aspects of students' psychological resistance forming when getting higher education in wartime. *Scientific Innovations and Advanced Technologies, 3*(31), 811-821. http://perspectives.pp.ua/index.php/nauka/article/download/9801/9854

Fan, J., Huang, Y., Yang, F., Cheng, Y., & Yu, J. (2024) Psychological health status of Chinese university students: Based on Psychological Resilience Dynamic System Model. *Frontiers in Public Health*, *12*, 1382217. https://doi.org/10.3389/fpubh.2024.1382217

Fang, Y., Ji, B., Liu, Y., Zhang, J., Liu, Q., Ge, Y., & Liu, C. (2022). The prevalence of psychological stress in student populations during the COVID-19 epidemic: A systematic review and meta-analysis. *Scientific Reports*, *12*(1), 12118. https://doi.org/10.1038/s41598-022-16328-7

Feng, N., Zhang, H., Cao, L., & Wang, X. (2024). Stress prediction based on chaos theory and an event–behavior–stress triangle model. *IEEE Transactions on Computational Social Systems.* https://doi.org/10.1109/TCSS.2024.3386752

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*, *11*(2), 213–218. https://doi.org/10.1016/0022-3999(67)90010-4

Igar, T. M. (2024). Mental health stability and stress management of teachers. *Nexus International Journal of Science and Education*, *1*(1), 11184395. http://nijse.org/index.php/home/article/download/12/12

Kee-Jiar, Y., & Chia-Keat, Y. (2020). Helping undergraduate students cope with stress: The role of psychosocial resources as resilience factors, *The Social Science Journal, 60*(1), 120-142. https://doi.org/10.1080/03623319.2020.1728501

Klochkov, V. (2022). Psychological factors of personality resilience: scientific views. *Bulletin of the National University of Defense of Ukraine*, *5*(69), 58-66. http://visnyk.nuou.org.ua/article/download/262865/261424

Kostryba, N., & Lyashko, L. (2023). Personal characteristics of psychological resilience among youth in wartime conditions. *Psychological Prospects Journal*, *42*, 82–96. https://doi.org/10.29038/2227-1376-2023-42-kos

Kristensen, S. M., Larsen, T. M. B., Urke, H. B., & Danielsen, A. G. (2023). Academic stress, academic self-efficacy, and psychological distress: A moderated mediation of within-person effects. *Journal of Youth and Adolescence*, *52*(7), 1512-1529. https://doi.org/10.1007/s10964-023-01770-1

Kundii, Z., Skrypnikov, A., Isakov, R., Kutsenko, N., Zinchenko, N., & Vasylyeva, G. (2024). Coping with War Stress in Ukrainian Students. in Shchokin, R., Iatsyshyn, A., Kovach, V., Zaporozhets, A. (Eds.)

Digital Technologies in Education: Selected Cases (pp. 111-125). Cham: Springer Nature Switzerland. https://link.springer.com/chapter/10.1007/978-3-031-57422-1_9

Limone, P., & Toto, G. A. (2022). Factors that predispose undergraduates to mental issues: A cumulative literature review for future research perspectives. *Frontiers in Public Health*, *10*, 831349. https://doi.org/10.3389/fpubh.2022.831349

Litwic-Kaminska, K., Błachnio, A., Kapsa, I., Brzezinski, Ł., Kopowski, J., Stojkovic, M., Hinic, D., Krsmanovic, I., Ragni, B., Sulla, F., & Limone, P. (2023). Resilience, positivity and social support as perceived stress predictors among university students. *International Journal of Environmental Research and Public Health, 20*, 6892. https://doi.org/10.3390/ijerph20196892

Liu, X., Zhu, C., Dong, Z., & Luo, Y. (2024). The relationship between stress and academic self-efficacy among students at elite colleges: A longitudinal analysis. *Behavioral Sciences, 14*, 537. https://doi.org/10.3390/bs14070537

Makhubela, M. (2022). Assessing psychological stress in South African university students: Measurement validity of the perceived stress scale (PSS-10) in diverse populations. *Current Psychology*, *41*(5), 2802-2809. https://link.springer.com/article/10.1007/s12144-020-00784-3

Moskalenets, V. P., & Fedyk, O. V. (2024). Psychological resilience of students in the conditions of the criminal war of Russia against Ukraine. *Slobozhansky Scientific Bulletin. Series: Psychology*, *1*, 116-125. https://doi.org/10.32782/psyspu/2024.1.21

Mykhaylyshyn, U. B., Stadnik, A. V., Melnyk, Y. B., Vveinhardt, J., Oliveira, M. S., & Pypenko, I. S. (2024). Psychological stress among university students in wartime: A longitudinal study. *International journal of science annals.*, *7*(1), 27-40. Retrived from https://dspace.uzhnu.edu.ua/jspui/bitstream/lib/63300/1/ijsa.2024.1.6.pdf

Pasinringi, M. A. A., Vanessa, A. A., & Sandy, G. (2022). The relationship between social support and mental health degrees in emerging adulthood of students. *Golden Ratio of Social Science and Education*, *2*(1), 12-23. https://doi.org/10.52970/grsse.v2i1.162

Rebryk, O. (2024). *A lot of international students remained in Ukraine during the war and actively help*. Hromadske.radio. Retrived from https://acortar.link/Whcciu

Sarbassova, G., Kudaibergenova, A., Madaliyeva, Z., Kassen, G., Sadvakassova, Z., Ramazanova, S., & Ryskulova, M. (2024). Diagnostics of psychological flexibility and the ability to cope with the inevitable changes among psychology students. *Current Psychology*, *43*(6), 5364-5376. https://doi.org/10.1007/s12144-023-04712-z

Schwartz, S. J., Cobb, C. L., Meca, A., Bautista, T., Sahbaz, S., Alpysbekova, A., & Szapocznik, J. (2024). Cultural stress, personal identity development, and mental health among US Hispanic college students. *American Journal of Orthopsychiatry*. Retrived from https://acortar.link/0CBsHL

Sharov, O. (2022). *The impact of war on higher education in Ukraine: Challenges and prospects*. Cedos. Retrived from https://cedos.org.ua/events/vplyv-vijny-na-vyshhu-osvitu-v-ukrayiny-vyklyky-ta-perspektyvy/

Shkolina, N.V., Shapoval, I.I., Orlova, I.V., Kedyk, I.O., & Stanislavchuk, M.A. (2020). Adaptation and validation of the ukrainian version of the Connor — Davidson Resilence Scale-10 (CD-RISC-10): Approbation in patients with ankylosing spondyliti. *Ukrainian Rheumatology Journal*, *2*(80), 66-72. Retrived from https://www.rheumatology.kiev.ua/wp/wp-content/uploads/2020/07/1187.pdf

Shtepa, O. S. (2018). The questionnaire of a personality's psychological resourcefulness: the results of development and approbation of the author's method. in Maksymenko, S. D., Onufriieva, L. A. (Eds.) *Problems of Modern Psychology: Collection of research papers of Kamianets-Podilskyi National Ivan Ohiienko University*, 39, (pp. 380–399). Kamianets-Podilski: Axiom. https://acortar.link/DJg28L

Slimmen, S., Timmermans, O., Mikolajczak-Degrauwe, K., & Oenema A. (2022). How stress-related factors affect mental wellbeing of university students. A cross-sectional study to explore the associations between stressors, perceived stress, and mental wellbeing. *PLoS ONE, 17*(11), 0275925. https://doi.org/10.1371/journal.pone.0275925

Spytska, L. (2024). Psychological stability of the individual in extreme situations. *European Journal of Trauma & Dissociation*, *8*(4), 100467. https://doi.org/10.1016/j.ejtd.2024.100467

Theron, L., Ungar, M., & Höltge, J. (2022). Pathways of resilience: Predicting school engagement trajectories for South African adolescents living in a stressed environment. *Contemporary Educational Psychology*, *69*, 102062. https://doi.org/10.1016/j.cedpsych.2022.102062

Wang, H., Jia, R., Zhang, M., & Fan, W. (2024). The influence of stress on mental health among Chinese college students: The moderating role of psychological suzhi. *Heliyon*, *10*(5), 26699. https://www.cell.com/heliyon/fulltext/S2405-8440(24)02730-0

Yena, A. (2024). Psychological resources of personality as a factor in overcoming stress. *Society and National Interests, 4*(4), 313-324. https://doi.org/10.52058/3041-1572-2024-4(4)-313-324

Yunusovich, A. V., Ahmedov, F., Norboyev, K., & Zakirov, F. (2022). Analysis of experimental research results focused on improving student psychological health. *International Journal of Modern Education and Computer Science*, *15*(2), 14. https://doi.org/10.5815/ijmecs.2022.02.02

Zhang, Z., Wang, T., Kuang, J., Herold, F., Ludyga, S., Li, J., ... & Zou, L. (2022). The roles of exercise tolerance and resilience in the effect of physical activity on emotional states among college students. *International journal of clinical and health psychology*, *22*(3), 100312. https://doi.org/10.1016/j.ijchp.2022.100312