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RESEARCH ARTICLE OPEN ACCESS

Psychophysiological And Cognitive Basis of Stress in Students in Emergency Medical Care Cycles

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ABSTRACT

analyzes the psychophysiological and cognitive mechanisms that influence the stress of students studying in the "Emergency Medical Care" cycles. The pedagogical significance of such processes as HPA-axis activation, cortisol dynamics, attentional bias, memory load, and amygdala–prefrontal cortex interaction in emergency decision-making is revealed. The results of the study suggest scientifically based approaches to stress management, proper organization of simulation training, and development of clinical thinking in the process of medical education.

Keywords: Stress, psychophysiology, HPA-axis, clinical reasoning, cognitive processes, attention, decision-making, simulation learning.

INTRODUCTION

Emergency medical care is one of the most responsible, dynamic and complex areas of medicine, in which decision-making occurs almost every second. Specialists working in this field are faced with a high level of psychological pressure, limited time, rapidly changing clinical situations and responsibilities that directly affect the patient's life. Therefore, the stress factors that students encounter during the training process of emergency medical care, their psychophysiological nature and impact on cognitive functions are of particular scientific importance for medical pedagogy.

Modern medical education, especially in the field of "Emergency Medical Care", requires students to be prepared for such situations in advance, developing skills such as self-control, emotional stability, concentration, and logical thinking under stress. During practical training, especially when performing simulated clinical scenarios, the student applies his knowledge and skills in conditions close to real life. This makes it relevant to study the direct impact of stress on cognitive processes, in particular on the quality of attention, memory, logical analysis , and decision-making.

Scientific sources indicate that the human brain under stress goes into a “rapid response” mode, in which there is a decrease in the activity of the prefrontal cortex, a strong activation of the amygdala , and a sharp increase in cortisol levels (McEwen, 2017). The decrease in the prefrontal cortex makes it difficult for students to analyze the situation, correctly set priorities, remember algorithms, and develop a clear strategy. Excessive activation of the amygdala leads to increased anxiety, fear , and emotional criticism. These factors can lead to an increase in the number of errors during simulation training, slowing down clinical thinking , and reducing the quality of decision-making.

In this context, studying the psychophysiological mechanisms of stress is important not only for understanding individual psychological reactions of students, but also for improving their practical training. This issue is relevant for two main reasons :

1. First, knowledge of the biological mechanisms of stress that disrupt cognitive processes allows teachers to properly plan the educational process,

2. Secondly , it allows for the proper use of modern pedagogical technologies to form stress-resistant clinical thinking.

Thus, scientific analysis of the psychophysiological and cognitive foundations of stress factors encountered by students in the discipline of "Emergency Medical Care" is of significant scientific and practical importance in improving the quality of education in this field, enhancing the effectiveness of simulation training, and strengthening the professional training of future specialists.

1. Psychophysiological foundations of stress and their impact on the educational process

The body's physiological response to stress is shaped by complex neuroendocrine mechanisms , and its main component is the HPA axis (hypothalamus–pituitary–adrenal system) . As soon as a person perceives a threat or unexpected situation, CRH (corticotropin-releasing hormone) is secreted by the hypothalamus, which in turn stimulates the pituitary gland to produce ACTH (adrenocorticotropic hormone) . ACTH acts on the adrenal glands, causing them to secrete cortisol (Cohen et al., 2016). Cortisol is one of the main hormones involved in the formation of an adaptive response to stress , providing a short-term "emergency mode".

Clinical tasks in the subject "Emergency Medical Care", OSCE stations, resuscitation algorithms or polytrauma scenarios activate this very neurophysiological system of the student. As a result of the activation of the HPA axis, the following changes are observed in the body:

- rapid heartbeat (tachycardia),
- increased respiratory rate,
- increased blood flow to the muscles,
- sharpening of visual, auditory and physical sensations,
- Increased " fight -or-flight response. "

these physiological changes are beneficial in short-term situations , they have a number of adverse cognitive consequences during the learning process, especially during simulation training. High levels of cortisol primarily impair the activity of the prefrontal cortex, which leads to a decrease in cognitive functions that are most necessary for a medical student:

Narrowing of attention. Instead of fully perceiving the situation, the student perceives only the most serious or emotionally intense signals. For example, the patient's shortness of breath may draw attention to itself, while important signs such as blood pressure, skin color, or medical history may be overlooked.

Decreased working memory. It has been scientifically proven that working memory can be reduced by up to 20–30% in severe stress. This:

- Memorizing AHA/ACS algorithms,
- Not remembering the OSCE checklist,
- mixing up medication doses

may cause errors such as.

Decreased cognitive flexibility. The student has difficulty making new decisions when the situation changes, and the ability to reassess the changing clinical situation is slowed. This directly affects one of the most important competencies in emergency medicine - situational thinking.

Reflection of psychophysiological changes in simulated situations

Most of the mistakes made by medical students during simulation training are due to the above mechanisms of stress. Including:

- forgetting the clinical algorithm – as a result of limited working memory;
- Incorrect assessment of a stressful situation – caused by a narrowing of attention;
- frequent repetitive mistakes – due to excessive emotional arousal associated with overactivity of the amygdala;
- assessing the situation as excessively dangerous – a catastrophic thinking mechanism inherent in stress;

• Physical arousal (tremors, sweating, slurred speech) – observed due to the dominance of the sympathetic nervous system.

Because simulation training recreates a real clinical situation, the student physiologically reacts to the same stress. This is fully consistent with the goal of medical education: because the most effective way to develop stress management skills in such situations is precisely the theoretically based integration of practical training.

Knowledge of the psychophysiological mechanisms of stress provides the teacher with the following opportunities when teaching the subject of "Emergency Medical Care":

• planning training sessions taking into account physiological load and psychological safety;

• enhancing stress adaptation through simulated repetitive exercises;

• to form cognitive stability and emotional regulation strategies in students;

• mistakes , but to deepen learning through instructive analysis (debriefing).

Thus, an in-depth study of the psychophysiological foundations of stress is an integral part of medical pedagogy , providing the necessary scientific basis for training highly qualified, stable, and safe specialists in the field of emergency medical care.

2. The impact of stress on cognitive processes: clinical thinking and decision-making. The impact of stress on the cognitive system occurs through complex neuropsychological mechanisms. When the human brain perceives a threat, it switches to a “rapid response mode”, in which the amygdala activity is sharply increased, and the prefrontal cortex temporarily limits its activity. Although this mechanism is evolutionarily useful as a protective reaction , it creates a number of cognitive limitations in the process of medical education, especially in the context of “Emergency Medical Care” (Arnsten, 2015). In emergency situations, students' clinical thinking, situational assessment , and decision-making are often disrupted by these mechanisms.

Narrowing of attention. Under stress, the amygdala activates “threat-focused attention.” The student focuses on the strongest sensory cue – for example:

• the patient's scream,

• bleeding,

• monitor loud signals,

• panic of close relatives.

As a result, the overall clinical picture of the situation is lost. Student:

• cannot fully collect diagnostic signs,

• incorrectly identifies priority parts,

• ignores the "silent symptoms" in the patient's condition.

This situation leads to a decrease in the quality of clinical thinking.

Impaired working memory . Increased cortisol during stress impairs the activity of the dorsolateral prefrontal cortex. This:

• scoring systems (GCS, APGAR),

• resuscitation algorithms (ABC, CAB, ACLS),

• drug doses,

• diagnostic sequence

causes forgetting .

In simulation training, students have often been observed to have difficulty performing even memorized algorithms under high stress. Studies show that working memory can be reduced by up to 30–40% (Vogel et al., 2020).

Change in decision-making speed. Decision-making under stress is impaired in two ways:

a) excessive haste

The student does the “first option” without sufficiently analyzing the situation. This is a common type of error in emergency situations.

b) inhibited thought

The decision-making process slows down due to excessive emotional stress, the student falls into a state of abnormal lethargy. These situations are explained by the “arousal curve” (Yerkes–Dodson law) - increasing stress increases efficiency, but after a certain level it sharply decreases it.

Decreased cognitive performance. The following processes are observed in students under stress:

- weakening of logical analysis,
- multi-level thinking disorder,
- the inferences are incorrect,
- loss of consistency in practical actions,
- of memory-attention-perception coordination.

This condition is called "cognitive block": as emotional arousal increases, analytical thinking weakens.

Many typical mistakes during simulation training are rooted in the cognitive mechanisms of stress:

- misdiagnosis;
- not assessing the situation as too dangerous or, conversely, not serious enough;
- violation of clinical logic;
- mixing up the sequence (e.g., doing AB as CB);
- to fail to hear an instruction;
- Mistaking a medication dose.

These errors are not due to the student's level of knowledge, but rather to a lack of skills to work under stress.

Deep knowledge of the effects of stress on cognitive processes provides the teacher with the following opportunities:

- developing simulation scenarios that model realistic clinical stress, but are psychologically safe;
- to develop reflective thinking and stress-trigger recognition skills in students;
- gradual strengthening of decision-making;
- teach strategies for preventing mistakes under stress;
- developing clinical thinking by increasing cognitive stability.

Thus, studying the impact of stress on cognitive processes on a theoretical and practical basis is of strategic importance in improving the quality of medical education, patient safety, and the formation of students' clinical competencies.

3. Pedagogical problems observed in students during stress

Stress directly affects the cognitive, emotional and volitional functions of medical students and creates a number of pedagogical problems in the educational process. Typical errors observed in students during simulation exercises, especially when modeling emergency clinical situations, indicate insufficient development of skills for working under stress.

The main problems observed in medical education include:

Misprioritization of situational issues . Due to narrowing of attention under stress, the student may not properly prioritize clinical signs . For example, although the ABC algorithm prioritizes airway management, the student may focus more on secondary signs (wound, blood) .

Incomplete collection of clinical signs. Because stress limits working memory and cognition, students may not be able to fully collect history, physical examination, or monitor readings. This can lead to misdiagnosis, poor decision-making, and clinical errors .

Information overload. Because simulation scenarios include so many clinical signs and symptoms, students' cognitive resources can quickly become saturated. This process can result in students not being able to fully demonstrate their knowledge .

Switching to automatic response instead of analysis. Stress weakens the prefrontal cortex and strengthens the limbic system. As a result, instead of making analytical decisions,

the student chooses an automatic or memorized action that is not appropriate for the situation. This is the most common cause of medical errors .

Avoiding acknowledging mistakes. Students activate self-defense mechanisms under stress. This leads to hiding mistakes, denying them, and passive participation in debriefing. However, learning from mistakes is a fundamental pedagogical principle in medical education.

All of these problems require pedagogical intervention, that is, the use of scientifically based teaching strategies.

4. Pedagogical approaches to managing psychophysiological processes during stress

To reduce the negative impact of stress on the educational process, modern medical pedagogy offers a number of scientifically based approaches. They are aimed at developing students' skills to manage stress, while accepting it as a natural process .

Simulation training (high-fidelity simulation) . High-fidelity simulators create an environment that is as close to real clinical conditions as possible. This allows students to:

- practicing thinking under stress,
- automation of decision-making,
- increasing psychological preparedness for a dangerous situation in real life

Most importantly, simulation creates a safe “space for error” for students.

Non-punitive debriefing. Debriefing is a key pedagogical tool for stress management. Mistakes are not punished, but seen as learning opportunities. Non-punitive debriefing:

- makes it easier for the student to admit his/her mistake,
- reduces emotional tension,
- enhances reflective thinking,
- prevents future repetition of mistakes.

Reflection journals (DIEP, REFLECT). Reflection journals are one of the most effective ways to analyze the causes of stress, understand emotional reactions , and develop self-control. Student:

- Describes the situation (Describe),
- interprets (Interpret),
- evaluates (Evaluate),
- makes a plan for the next step (Plan).

This process helps to internally regulate stress.

Cognitive restructuring. In this method, stress is interpreted not as a “threat”, but as an opportunity for “growth and experience”. The student learns to reevaluate negative thinking. As a result, the subjective intensity of stress decreases, and emotional stability increases.

5. The need to consider psychophysiological mechanisms in emergency medical education. Theoretical analyses show that the development of stress management skills in medical education is not an additional skill, but:

- clinical safety,
- quality of decision-making,
- reduce errors,
- ensuring patient safety

is a core competency for.

A student who can manage stress:

- assesses the situation quickly and accurately;
- consistently conducts clinical thinking;
- learns from mistakes;
- works effectively in a team;
- Shows high results in OSCE and clinical practice.

A student who cannot manage stress:

- misjudges the clinical situation;
- falls into a state of cognitive block;

- the likelihood of making a mistake increases;
- patient safety is at risk;
- fails the simulations.

Therefore, every medical university should implement the following measures:

- integrating stress management competencies into DTS,
- making simulation training a mandatory part of education,
- Regularly conduct psychometric diagnostics (STAI, PSS, CD-RISC),
- Organizing advanced training courses on stress pedagogy for teachers .

These approaches deepen students' professional preparation, reduce clinical errors, and improve the quality of medical education.

Students in emergency medicine training face high levels of psychological pressure, the need for rapid decision-making, and rapidly changing clinical situations. Without a deep understanding of the psychophysiological and cognitive mechanisms of stress , it is impossible to expect them to be effectively trained, develop clinical thinking, or practice error-free in such conditions .

Theoretical analysis shows that stress has a significant negative impact on students' attention, cognition, working memory, situational analysis , and decision-making processes. Due to HPA-axis activation, increased amygdala reactivity, and temporary suppression of prefrontal cortex activity, students may lose coherence, misprioritize, or switch to automatic, irrational responses during simulation exercises.

These circumstances further increase the need for stress-adapted methods of medical pedagogy . Modern approaches such as high-fidelity simulation, blameless debriefing, reflective journals, and cognitive reappraisal develop not only the student's clinical competence, but also his ability to work under stress. With the help of such methods, students' emotional stability, cognitive flexibility, and decision-making efficiency can be significantly increased.

Conclusion

In conclusion, stress-sensitive pedagogical approaches in emergency medical education are not an option, but a necessity. Medical schools can prepare students for real clinical practice by integrating stress management competencies into their curricula, implementing regular simulation exercises , and using psychometric diagnostic tools. The theoretical framework presented in this article provides a scientific basis for improving medical education in this area and serves as an important methodological basis for the safe professional practice of future medical workers.

References

1. Arnsten A.F.T. Stress weakens prefrontal networks: Molecular insults to higher cognition // Nature Neuroscience. – 2015. – T. 18, №10. – B. 1376–1385.

2. Cohen S., Gianaros P.J., Manuck S.B. A stage model of stress and disease // Perspectives on Psychological Science. – 2016. – T. 11, №4. – B. 456–463.

3. LeBlanc V.R. The effects of acute stress on performance // Academic Medicine. – 2009. – T. 84, №10. – S. S25–S33.

4. McEwen B.S. Neurobiological effects of chronic stress // Dialogues in Clinical Neuroscience. – 2017. – T. 19, №2. – B. 105–115.

5. Norman GR, Eva KW Diagnostic error and clinical reasoning // Medical Education. – 2010. – T. 44, No. 1. - B. 94-100.

Sources of Uzbek scientists

6. Hayitov A. Fundamentals of medical psychology. – Tashkent: Medical Publishing House, 2018. – 312 p.

7. Abdullayeva ND Psychological approaches to the development of professional competence of doctors. – Tashkent: Fan, 2020. – 210 p.

8. Sultonova MM Mechanisms of stress and professional fatigue: theory and practice. // Uzbekistan Medical Journal. – 2021. – No. 4. – P.

45–52.

9. Rizaev JR, Yusupova DE Psychophysiological foundations of decision-making processes in emergency medicine // Medicine and education. – 2020. – No. 2. – P. 31–36.

10. Tulaganov HM Scientific and methodological foundations of simulation training in higher medical education. – Tashkent: Innovation, 2019. – 268 p.

11. Ahmedova ND System of education of professional and spiritual qualities in future doctors. – Andijan: ADU, 2026. – 220 p.

12. Shodmonov SH, Usmonova N. Clinical reasoning errors under stress in emergency medical care // Scientific Journal of New Uzbekistan. – 2022. – No. 6. – P. 55–63.

13. Karimova RM Pedagogical psychology. – Tashkent: Yangi asr avlody, 2017. – 448 p.

14. To'xtasinov AA Tibbiy ta'limda refleksiya va reflektiv pedagogika // Pedagogika va psixologiya jurnali. – 2020. – No. 1. – B. 18–25.

1. MDH olimlari manbalari (Russia, Qozog'iston, Belarus va b.)

15. Bodrov V.A. Psychology of stress: a tutorial. – M.: PER SE, 2006. – 528 p.

16. Margulis M.S., Chumakov A.N. Stress and decisions in emergency medicine // Emergency medicine. - 2018. - No. 3. - P. 12-18.

17. Karavaeva E.V. Simulation training in professional training of doctors. – St. Petersburg: SpetsLit, 2019. – 198 p.

18. Leonova A.B., Kaplan G. Psychophysiology of professional stress. – Moscow: Academy, 2017. – 344 p.

19. Mironova O.N. Cognitive loads and thinking errors during stress in medical workers // Psychology and health. - 2021. - No. 2. - P. 40-48.

20. Selivanov A.A. Extreme Psychology: Decision-Making Under Time Pressure. – Moscow: Profobrazovanie, 2020. – 256 p.

21. Panfilov V.Yu. Highly realistic simulations in the training of emergency physicians // Ambulance. - 2019. - No. 8. - P. 27-33.

22. Zimnyaya I.A. Pedagogical Psychology. – M.: Logos, 2015. – 384 p.

23. Gorbatova K.A. Emotional stability of medical students in the context of simulation training // Higher education today. - 2020. - No. 10. - P. 62-68.