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HOW STRESS AFFECTS HUMAN HEALTH

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Annotation: This article comprehensively analyzes the phenomenon of stress, which is one of the most pressing problems of modern psychology and physiology. In the research, along with the traditional classification of stress — acute, episodic, and chronic types — the negative consequences of hypostress (lack of stress), a condition that has been little studied but is dangerous for human life, are thoroughly explained. Based on the Yerkes–Dodson law, the importance of the "golden mean" necessary for human efficiency and the concept of beneficial stress (eustress) are revealed. In the central part of the article, the biochemical mechanisms of stress are analyzed, in particular the activity of the hypothalamus–pituitary–adrenal axis (HPA axis) and the effects of the hormones cortisol and adrenaline on the organism. Additionally, age-related characteristics of stress — toxic stress in childhood, emotional instability in adolescence, and occupational "burnout" in adults — are compared, and strategies for activating natural antidotes such as oxytocin, endorphin, and serotonin hormones are recommended.

Introduction

In the modern world, humanity lives under an unprecedented level of dynamic changes and information pressure. The concept of stress is no longer merely the body's response to emergency situations, but has become an integral part of daily life. This complex adaptive mechanism, formed during human evolution, actually serves to protect us from negative influences of the external environment and to ensure our survival. However, today the imbalance caused either by the excessive activation of this protective system or, conversely, by the decrease in life activity poses a serious threat to human health. Global statistical data show that in recent years, due to factors such as socio-economic instability, constant dependence on digital technologies, and global pandemics, the general level of human anxiety has been steadily increasing. Stress is no longer just a temporary psychological condition, but has become a systemic problem affecting all layers of society — from children to adults. Its long-term impact has the ability to disrupt not only a person's psychological stability but also the functional activity of physical organs. The aim of this article is to analyze the essence of stress, reveal its connection with biochemical processes occurring in the organism, and study the characteristics of stress manifestation at different stages of life. Additionally, throughout the article we attempt to understand the subtle boundary between the positive and negative aspects of stress and to consider scientifically grounded strategies for maintaining psychological balance in the conditions of modern life.

Main Part

The phenomenon of stress manifests itself in various forms in human life, and its impact on the organism primarily depends on the duration and intensity of this condition. Specialists divide stress into three main types, each having its own physiological and psychological characteristics. [1]First of all, acute stress is the most common form, representing the body's rapid response to

immediate pressures or unexpected events. This type of stress is short-term and usually encourages alertness and helps a person successfully complete a task.Chri However, if acute stress situations occur too frequently in a person's life, it may turn into episodic acute stress. Such individuals live in a constant state of disorder, hurry, and "permanent crisis," which keeps their nervous system under continuous tension. The most dangerous form is chronic stress**,** which can last for months or even years.[2] Chronic stress gradually exhausts a person's willpower and physical resources, as it arises from difficult-to-resolve social, financial, or family problems. It should be emphasized that modern psychology has proven that not only an excess of stress but also its deficiency — the state of hypostress — can be harmful to human health. According to the famous Yerkes–Dodson law, a certain level of excitement and "positive stress" (eustress) is necessary for a person to achieve maximum efficiency.[3] If stress is completely absent, a person sinks into boredom, purposelessness, and apathy. This situation can be compared to a guitar string: if the string is pulled too tightly — it breaks; if it is too loose — it produces no music. Therefore, the effects of stress manifest differently depending on the stage of human life. For example, in children strong stress slows brain development, while the lack of stress (excessive protection) can make them weak-willed and unable to cope with life's difficulties.[4] In adolescents, this condition may manifest as aggression or loss of interest in life, while in adults chronic stress directly leads to occupational burnout and physical illnesses.[5] To understand the effect of stress on the human organism, it is necessary to analyze its biochemical mechanism. As soon as a person senses danger or pressure, the hypothalamus region in the brain becomes activated and sends special signals to the adrenal glands. As a result, hormones responsible for the "fight or flight" response — adrenaline and cortisol — are rapidly released into the bloodstream. The hormone adrenaline accelerates the heartbeat within seconds, increases blood pressure, and provides additional strength to the muscles. Cortisol, as the main stress hormone, increases the level of glucose in the blood, supplying the brain and other vital organs with additional energy. However, the organism also has stress-controlling "antidotes" — the so-called happiness hormones such as oxytocin**,** endorphin**,** and serotonin, which are released during social interaction with loved ones and physical activity, reducing the harmful effects of cortisol. Unfortunately, if stress becomes chronic, the level of cortisol remains constantly elevated in the blood, leading to devastating consequences for the organism: the immune system weakens and a person becomes more vulnerable to infectious diseases; metabolic disorders increase the risk of diabetes and obesity; and the parts of the brain responsible for memory become damaged. Global data indicate that between 2007 and 2021, the stress level of the world's population steadily increased, especially under the influence of digital technologies and the COVID-19 pandemic.[6] Today stress is not only an individual problem but also stands at the center of medicine as a major catalyst of cardiovascular diseases and deep depression. Therefore, finding the "golden mean" of stress and studying strategies to control it has become a vital necessity for modern individuals.

Conclusion

In conclusion, it should be emphasized that stress is an inseparable and, in some sense, necessary part of modern human life. As discussed throughout the article, stress is not only a negative concept but also an important factor that stimulates development and productivity in the organism. However, for human health and longevity, finding the "golden mean" of stress — that is, avoiding chronic pressure (distress) while also preventing the apathy caused by lack of stimulation (hypostress) — is a vital necessity. Research shows that the most effective way to control stress is to understand its biochemical mechanisms and regulate hormonal balance in the body through natural methods. Regular physical activity, quality sleep, sincere communication with loved ones, and proper time management are simple yet powerful strategies that stimulate the release of "happiness hormones" such as oxytocin and endorphins in the body. In turn, this neutralizes the harmful effects of cortisol, the main cause of chronic stress. In today's era, when

global stress levels are increasing, each age group — children, adolescents, and adults — requires a specific approach. Maintaining psychological balance is not only the key to personal happiness but also the most reliable guarantee for preventing physical illnesses. Therefore, accepting stress not as an enemy but as energy that must be managed creates the foundation for a more stable, healthy, and meaningful human life.

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