



## Theoretical Aspects of Stress: A Review Article

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**ABSTRACT:** Stress can have real effect on physical, mental, and social wellbeing of a person. The aim of the current paper is to present theoretical basis regarding stress and its modern consideration. General types of stress and impact mechanisms are presented as well as the leading theories in the field are compared and discussed. The review is focused on the adverse effects of stress on the different organs and systems of the human body, thus providing information and underlining the necessity of effective coping strategies. The latter are presented in the background of primary, secondary and tertiary prevention of the negative consequences of stress - all stress-related conditions and diseases.

**KEY WORDS:** stress, types of stress, medical practice, stress impact, theories of stress

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### I. INTRODUCTION

Stress in psychology, neurology and psychiatry is a state of strong physical, nervous tension caused by negative factors or negative physical or emotional impact and sensation. This is especially true of high and even very high levels of stress, which can have a negative effect on physique, emotions, and mental concentration, while lower levels can be factors in adaptation and coping [1,2]. Stress is defined as a non-specific reaction of the body to any requirement for restructuring or adaptation, carried out in a stereotypical way based on identical biochemical changes, but also in a non-stereotypical way, where new factors and processes are introduced in biochemistry [3]. Stress reactions have been observed in both humans and lower animals without a nervous system and in plants. Stress is not just nervous tension. The reason for its appearance is often intense emotional and even physiological experiences. About 75% of physical illnesses are related to stress [4].

In medical practice (or in dentistry – as a special branch of medical science) there is an increasing demand of discussing the problem about stress as medical activities are held in the background of many specificities. Along with providing quality and timely medical assistance, based on a very high level of professionalism, medical practitioners need to deal with many other aspects of their profession. An integral part of the modern professional attitude of the therapist should be the holistic approach (bio-psycho-social model) to the patient. Medical professionals must be ready to accept in their office not just a sick person, but a social personality who brings his positive and negative experiences, ideas, expectations and hopes, expressed in worries, fears, and potential for active participation in the treatment process. The modern behavioral framework of the practitioners integrates the construction of a comprehensive individual approach, high quality, and efficiency in providing medical (dental) care to each patient. It has been proven that the results of treatment are a function of the effective interaction between the therapist and his team, on the one hand, and the patient - on the other. In many cases, however, the complex interpersonal relationships, as well as a great variety of other factors, may contribute to a stressful working environment. The aim of this paper is to clarify theoretical aspects, basic types of stress and general mechanisms of stress impact. Focusing on negative stress consequences on physical and mental health will increase medical practitioners' awareness on the issue, thus providing opportunities to pay attention on prevention strategies, which in a longer perspective will ensure them better health and professional longevity.

### II. STRESS – DEFINITIONS AND MODERN CONSIDERATION

A proven fact is that stress can lead to many negative consequences, regarding one's physical and/or mental health. On the other hand, stress is not something that should be avoided - and it cannot be avoided. When a person is relaxed and asleep, he is again under the influence of a certain stress. The heart continues to

push blood to vital organs, muscles to move the chest to keep breathing. Even his brain is unable to rest. The complete absence of stress means death [5].

The term stress was first used in the familiar sense by the Canadian physiologist Hans Selye (1907-1982) in the mid-20th century. He believed that stress was a part of life. Today, the World Health Organization defines stress as the epidemic of the 21st century, and we accept that stress is a way of life [6].

What prerequisites give us grounds for this statement?

Way of life or lifestyle, is a moral set of behaviors that is meaningful to both others and oneself at a given time and place, including social relationships, consumption, entertainment, dressing, etc. Behaviors and practices in a certain way of life are a mixture of habits, generally accepted approaches to "doing things" and reasonable actions [7]. The way of life reflects the values and worldview of the person. It can be a source for the creation of cultural signs and artifacts, which in turn can affect the identity. Lifestyle can be a conscious or unconscious choice, but not all aspects of lifestyle can be completely voluntarily chosen, as the social environment can provide a definite and accurate choice for a person for his lifestyle, and this choice is based on the types of way of life from the environment that surrounds him. The "way of life" as a definition first appeared in 1939. Alvin Toffler was the first to anticipate this, saying that the ways of life would arise as a result of the growing disparities in post-industrial society [8,9]. In his book *The Third Wave*, Toffler described three types of societies based on the idea of waves - each new society displaces the old society and culture. The first wave was the society after the agrarian revolution, which replaced the hunter-gatherer culture. The main components of the Second Wave society are: the family, the production type of education system and the corporation. Toffler wrote: "Second Wave society is industrial and based on mass production, mass distribution, mass consumption, mass training, mass media, mass entertainment, and weapons of mass destruction. Combine these things with standardization, centralization, concentration and synchronization and you will end up with an organizational style that we call bureaucracy." The third wave is post-industrial society. Toffler added that since the 1950s, most countries have formed Third Wave societies. He invented many words to describe it and mentioned words invented by other people as the Information Age. According to him, the homogeneity of the society of the Second Wave is replaced by the heterogeneity of the Third Wave. There will be a process of demassification and it will not pass either the family, with its forms and functions, or the value orientations.

A post-industrial society is a society that goes through the phase of domination of the secondary economic sector and moves to a structure of society based on the provision of information services, innovation, finance, and services. It has the following characteristics: transition from supply of goods to services; knowledge becomes valuable capital ("knowledge society") [10], creating ideas is the main way to drive the economy, globalization, automation; application and supplementation with behavioral and information sciences and technologies.

These characteristics of modern society determine the rapid development of technologies leading to a serious change in lifestyle, the main of which is the problem of blurred boundaries [6]:

- The modern world is associated with more and more responsibilities and less and less freedom.
- Thanks to technology (computers, telephones, internet, social networks ...) a person is constantly accessible, confidentiality in people's private lives is removed.
- The boundaries between home and work are increasingly blurred.
- The dynamics of family relations and the way of working are changing.
- The number of stressors is increasing, leisure time is declining, new global threats are emerging - terrorism, global warming, migration processes, global epidemics, etc.

Therefore, stress in our lives is inevitable. In our daily lives, we face a variety of situations and the constant need to make choices, each of which is somewhat stressful. Stress is a normal companion in our daily functioning. It cannot be avoided and can, in certain circumstances, lead to disturbances in our physical and mental functioning [11].

There are numerous definitions of stress. The important thing is that the chosen definition must reflect the dynamics of the state. What is stressful for a person at some point in his life may not be stressful at another time. Stress can be seen as a balance between the requirements of our environment (stressors) and the individual's ability to cope (buffers) with these requirements. In the presence of severe stressor and inadequate coping skills, the level of stress will be high. Conversely, when buffers are stronger than the stressor, the stress level will be low. It should be borne in mind that this balance is not constant and can change every day or even every hour. According to this model, there are two ways to reduce stress: reducing external stressors and increasing the ability to cope with it.

When the balance between the intensity of environmental stressors and the body's coping capacity is disturbed (see H. Selye), it can lead to dysfunctions in the central nervous system, endocrine regulation, and the immune system - various stress-related diseases occur.

The initial reaction of the body to each stressor is associated with the presence of bodily reactions. Our body responds to stress by activating two systems - the autonomic nervous system (ANS) and the endocrine

system (ES). Under stress, the brain automatically drives a cascade of reactions by activating ANS or ES. The body's response to stress is automatic and it is not something we consciously choose to do or not do. The autonomic nervous system is that part of the nervous system that responds and processes stress. It has two parts - sympathetic (responsible for bodily reactions to stress) and parasympathetic (responsible for relaxation and return to normal condition after stress). The endocrine glands secrete various hormones (e.g., adrenaline) during stress. Stress releases chemicals from the brain that lead to increased blood sugar and fatty acid levels, increased heart rate and blood pressure, and so on. These changes prepare the body for "fight or flight," a reaction that aims to save and survive us [11].

As mentioned above, however, if the intensity of the stimulus is large enough and/or its effect lasts for a very long time, the body loses its resistance.

*Immune system.* Stress reduces the capacity of the immune system to fight the bacteria and viruses that occupy our body. Under stress, lymphocyte production decreases and it is more difficult for the body to cope with the disease. Lymphocyte deficiency makes people more vulnerable to diseases to which they are already predisposed, e.g., asthma and eczema.

The following diseases of the immune system are considered to be due to or exacerbated by stress: allergies, arthritis, multiple sclerosis, rheumatoid arthritis, vitiligo, and others.

*Cardiovascular system.* Stress releases fatty acids into the bloodstream, which are transformed into cholesterol. It is deposited in the walls of blood vessels (arteries) and narrows them (atherosclerosis). Narrowing leads to high blood pressure. Chronic stress also leads to increased blood clotting (coagulation). In addition to the direct effects on the cardiovascular system, which ultimately lead to diseases such as hypertension, coronary heart disease, heart attacks and strokes, there are also indirect ones. They are associated with the use of maladaptive mechanisms to deal with stress such as smoking and alcohol abuse, which in themselves are a risk factor for the development of cardiovascular disease. Some of the diseases of the cardiovascular system, which are definitely related to stress are: atherosclerosis, essential hypertension, Buerger's disease (thromboangiitis obliterans), Raynaud's syndrome (a condition in which body overreacts to certain situations causing cold and numbness in the hands and feet), tachycardia, and others.

Chronic stress is related also to diseases of other systems (e.g., digestive system). Such diseases are gastric ulcer, irritable bowel syndrome (IBS, spastic colon), most gastritis, chronic ulcerative hemorrhagic colitis, and others. In addition, under stress, there are various emotional manifestations such as: anxiety, depression, anger, irritability, and internal tension. There are also behavioral and cognitive changes such as: changes in appetite, sleep, disturbances in concentration and memory, easy forgetting [11].

### **III. TYPES OF STRESS & STRESS IMPACT**

According to the source of stress, the latter could be as follows [4,6]:

- Stress of senses:
  - Visual stress - excessive combinations of bright and diverse colors; images that make it difficult to see excessively, image blur (when it is excessive).
  - Hearing stress - originating from noise sources, constructions, heavy passing machines, etc.
- Stress from personal accidents - physical injuries and traumas, unwanted types of communication.
- Stress from social (civil) influences and disasters - traffic, overcrowding, politics, etc.
- Stress from socio-economic factors - low incomes, loans, etc.
- Stress from environmental influences - solar flares, disasters, etc.

According to the effect of stress:

- Positive stress (good stress, eustress) – it leads to increased cognition, reaction, and activity. It can be provoked by performing an activity that is expected to bring positive and desired results, expectation or undertaking an extreme experience, etc.
- Negative stress (distress) – it includes all types of irritants that can be assessed as unpleasant, frightening, disturbing the normal level of calm; in more severe situations, these external factors can be even life-threatening.

According to the intensity and duration of the stressor:

- Acute stress - high intensity of the stressor for a short period.
- Chronic stress - low intensity of the stressor for a long period.

According to the time for coping with stress:

- Situational stress - after the removal of the stressor the nervous and emotional tension disappear.
- Post-traumatic stress - the experience of nervous and emotional tension is not during the action of the stressor, but only after that – it usually occurs within 24 hours and lasts indefinitely.

Stress in personal, professional, or social environment of the individual is undoubted. It is a universal companion in human everyday life. The impact of stress, however, is not always reported by many physicians, who underestimate the health significance of this factor. While the influence of a mechanical, physical, or

chemical factor is clear and obvious (e.g., sunburn), the influence of stress is most often hidden and long-term, over a long period of time. For example, chronic family distress can manifest in a specific disease only after 5, 10 and more years. The following mechanisms of stress impact are known:

1. Direct / Indirect.
2. Positive / Negative.

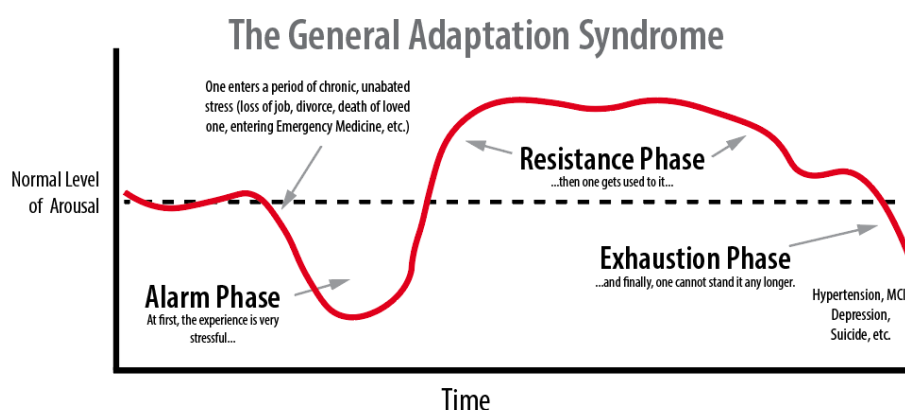
Direct influence is especially evident in psycho-emotional stress and distress. It is known that both acute and chronic stress can provoke myocardial infarction, diabetes, and others. Chronic distress is the main cause of modern "diseases of civilization" - psychoneurosis, insomnia, ischemic heart disease, diseases of the digestive system and others. Indirect effect has not yet been sufficiently studied. The difficulties stem from the multifactorial etiology of most modern diseases. As a negative factor, stress can: cause disease(s) directly, create or stimulate a predisposition to a certain disease, affect the course of a disease [12]. Positive effects of stress should also not be underestimated. Stress can lead to increased motivation, activity, and creative attitudes.

#### IV. THEORIES OF STRESS

János Hugo Bruno "Hans" Selye (1907-1982) - a Canadian endocrinologist of Austro-Hungarian descent - described the reactions to stress in the 1940s. According to him, the body's response to stress is the same regardless of the type of stressor (positive or negative) [13]. Selye's laboratory experiments began in 1926, when he was a second-year medical student [5]. Even then, he was looking for the problem of the stereotypical reaction. He studied laboratory mice by injecting them various toxic extracts from glands, subjecting them to various damaging factors such as heat, cold, injuries, bacteria, toxins. All of them caused a complex of simultaneously occurring changes in a given organ, so-called "stereotyped syndrome" in which the hypothalamus - pituitary - adrenal gland (which secretes corticoids - adrenaline and cortisone) – HPA axis - take part. The changes that occurred as a result of these agents were atrophy of the thymus, lymph nodes, ulcers of the gastrointestinal tract and hyperactivity of the adrenal glands, suppression of inflammatory reactions that mobilize the body to defend against severe irritation of the stressor. Selye called this reaction in 1936 "a syndrome caused by various harmful agents", which later changed under the name of general adaptation syndrome (figure 1) or biological stress syndrome. It generally takes place in three phases:

1. Alarm stage
2. Resistance stage
3. Exhaustion stage

In case of an alarm signal and provided that the impact of the stressor is compatible with the body's resistance, it is mobilized to a change regarding the initial impact of the stressor. But the body's resistance decreases and if the stressor is very strong (severe burns, high temperature), death can occur. During the resistance phase, if the impact of the stressor is compatible with the adjustment, a resistance phase occurs. The signs of anxiety disappear, and the resistance increases above normal. The body prepares to fight or flight from the stressor. In the third phase, as a result of prolonged exposure to the stressor to which the body has adapted, the adaptive energy is depleted, and the signs of an anxiety reaction reappear, but unfortunately irreversible, death occurs due to tissue damage.



**Figure.1.** The general adaptation syndrome. Source of image: <https://www.stresscoach.it>

In stress reaction adrenaline rises and plays an important role in the body's response. The axis hypothalamus - pituitary - adrenal cortex is of greatest importance for maintaining balance of the internal environment of the organism (homeostasis). It is a cascading system consisting of the hypothalamus, which connects to the pituitary gland regulating the activity of the adrenal gland. The stressor excites the hypothalamus

and causes it to produce a substance that stimulates the pituitary gland to start secreting adrenocorticotrophic hormone, which in turn activates the adrenal glands and leads to the secretion of corticoids (cortisol). Corticoids do not play a special role in cortical stress. Under prolonged stress, however, they activate metabolism. This leads to the formation of blood sugar from fats or proteins thus providing the energy the body needs to cope with the challenges. Another characteristic feature of the stress response is the occurrence of peptic ulcers of the stomach and intestines. This is facilitated by the content of corticoids in the blood and the autonomic nervous system. The autonomic nervous system regulates the functions of the body's organs, helping it to adapt autonomously to changing external conditions. Under its control the smooth muscles, blood vessels, heart, endocrine glands are. The sympathetic and parasympathetic parts function on the opposite principle. The sympathetic nervous system, if activated, leads to increased metabolism, increases the frequency and strength of contraction of the heart muscle, increases the amount of blood sent to the internal organs. The bronchi dilate to increase oxygen flow. The secretion of sweat glands increases. The pupils dilate, the activity of the gastrointestinal tract slows down. When the parasympathetic nervous system is activated, the metabolism decreases, i.e., it has the opposite function to the sympathetic nervous system. The bronchi shrink, only the activity of the pancreas increases, the gastrointestinal tract is activated.

Under the influence of the stressor, changes occur in the hypothalamus, pituitary gland, adrenal glands and gastrointestinal tract, the body increases its physiological activity, and seeks to regulate and stop the reaction while maintaining its homeostasis.

Incidental or short-term stressors do not cause long-term effects in the body, while prolonged exposure to stress causes physiological exhaustion. Selye found that each organism had an optimal level of stress and that both overexposure and insufficient stress caused a deterioration in the level of functioning. In other words, prolonged stress can lead to injuries. The body manifests a stress response by raising blood pressure, raising the level of adrenaline, changing the heart rate, producing more red blood cells, slowing digestion, etc. or these are the manifestations of negative stress called distress by Hans Selye.

The theory of H. Selye has a great influence on the scientific research in biology, physiology, medicine, psychology, and other sciences. For example, in the early 1990s, endocrinologists proved that stress played a role in mediating between the environment and the genetic apparatus. Sudden changes in the environment, provoking a state of stress, mobilize hidden genetic variability, which in turn facilitates the search and selection of the most adaptive options. This general extension of the range of variability is associated with stress responses and the immediate influence of stress hormones on genes.

Along with the positive effects that Hans Selye's ideas have contributed to, the main criticism of him is that he ignored mental processes at the expense of physiological reactions. That is why his theory is not accepted unanimously in the scientific community.

The theory of Richard Lazarus, a professor at the University of California, has made a special contribution to the development of the problem of stress [14]. The scientific community became acquainted with his theory for the first time from the report "Theory of Stress and Psychophysiological Research", presented at a symposium in Stockholm, Carolingian Institute in 1965. Later the theory was published in his book *Psychological Stress and the Coping Process* in 1966. It was later developed by him and his collaborators under the name *Transactional Theory of Stress*. According to him, mixing of physiological and mental levels leads to a misunderstanding of stress, as the same physiological reaction can occur both in physical impact on the body and as a result of mental factors.

An example of the difference between physiological and mental levels of stress analysis is the classic research of Shannon et al., 1962 [15]. They conducted a series of experiments related to the adrenocortical hormonal response of patients in a dental office who had their teeth filled or under local anesthesia. These procedures were found to be associated with a pronounced adrenocortical hormonal response. It was later found that the expectation of this procedure also caused a stress response. The intensity of the adrenocortical reaction when caused only by the psychological factor increases significantly, i.e., the physiological index of the stress response - in this case hydrocortisone is activated by the experience of threat. In other words, physiological and mental stress give rise to similar physiological responses, but in physiological stress they are stereotypical (nonspecific), while mental stress does not always lead to expected reactions. They can be different: fear, anger, depression, anxiety, dysfunction, and others [5].

If we make a comparison with the physiological approach of H. Selye, then despite the differences in the specific details, there is a general adaptive response, which is independent of the specific nature of the stimulus. The psychological point of view emphasizes the specificity of the adaptive reaction, i.e., depends on the nature of the stimulus and on the individual characteristics of the organism. According to R. Lazarus, the stress response can be considered only in the context of the structure of the personality, which interacts with external situations through cognitive processes, namely the process of risk assessment and the process of dealing with stress. To understand the mental process that mediates the transition from stimulus to reaction, appraisal is crucial. The primary appraisal includes the process of perception and assessment of the threat by the individual, and the secondary appraisal - the process of finding a potential response to this threat. Coping with stress is a

process of fulfilling this response. This understanding of the significance of the appraisal process can be illustrated by Shakespeare's words: "... for there is nothing either good or bad but thinking makes it so..." (Hamlet, act 2, scene 2) [5].

The cognitive explanation of stress in modern psychological theory is relatively new - it has become popular in the last twenty years. The various theories that present it are not well organized and integrated. But it can be pointed out that the cognitive approach affirms the role of the thought process. It functions by interacting with the outside world, creating our emotions. And they actually generate anxiety or calm. Past experience determines the perspective, the assessment of events and ourselves, including beliefs about the ability to deal with certain situations. Beliefs and interpretations of threatening situations determine the actions and emotions experienced.

Psychologists working in the field of cognitive paradigm and social learning believe that there are several main phases of the stress process:

1. Perception of the situation, which may be realistic or distorted.
2. Assessment of the situation, i.e., whether it is important to us or not, whether it threatens us and in what way.
3. Assessment of one's own coping abilities and decision-making for response.

R. Lazarus forms a modern understanding of stress, defining it as a relationship between a person and the environment, in which the environment tests the person and exceeds his resources for coping, which threatens the mental well-being of the person.

## V. COPING STRATEGIES FOR STRESS

Coping strategies for acute/chronic distress in the workplace find practical expression in the effective prevention of the negative consequences of stress - all stress-related or stress-induced diseases.

Their **primary prevention** aims to prevent the occurrence of these diseases. This can be achieved by eliminating stressful working conditions and reducing their adverse effects. The main stress reduction programs are [16,17]:

- Programs for improving and optimizing working conditions.
- Workers' rights advocacy programs.
- Conflict resolution programs.
- Training of employees for decision making.
- Training in interpersonal skills.
- Training in time management skills and avoiding "time" stress.

The main goal of **secondary prevention** is to change the way a person responds to stressors. It is aimed at workers who are personally predisposed to a certain disease (e.g., burnout syndrome, depression, anxiety, etc.) and/or with initial manifestations of the condition. It is often referred to as *stress management*. Stress management programs are:

- Autogenic training.
- Biofeedback training.
- Deep breathing.
- Muscle relaxation.
- Yoga Stretching.

**Tertiary prevention** (in the presence of disease, often with complications) aims to prevent disability and maintain maximum functioning. It includes treatment of the physical, mental, and behavioral effects of stress. Individual psychotherapeutic sessions are conducted in order to restore the psycho-energetic potential of the affected individual. In these cases, there is often a reduction in some of the symptoms, but the quality of work is not affected. Therefore, the timely detection, clarification, and elimination of etiological factors (different types of stressors) is extremely important for the proper targeting and good organization of prevention strategies.

## VI. CONCLUSION

Nowadays stress is an integral part of human life, personal relationships, and different occupations. If it refers to "helping professions", the problem needs special attention as the negative effects of stress can have long-term consequences both for patients' and practitioners' health. Strategies for primary, secondary and tertiary prevention gain particular relevance. Sometimes specialized help is needed to overcome stress adverse effects. Recognizing the problem and the need for help in some cases is particularly difficult. One simply thinks that it will get better and that the phenomenon is temporary and constantly postpones the search for a solution. But the problem may deepen and unlock a bunch of other diseases behind it. That is why in the presence of symptoms of any condition, it is necessary to seek help before the damage to the psyche, personality and health is too great!

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