The Operating Mechanism of Stress in Nervous System and How to Adjust Emotion to Reduce the Harm of Stress to Human Body

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Abstract: Stress is a process of adaptive and responsive response when an individual is confronted with or perceives the threat or challenge of environmental changes to the organism, which is often referred to as the psychosomatic response to stress. In order to help pilots to adjust their mental state, maintain physical and mental health, maintain positive emotional learning and training, avoid the harm caused by excessive stress reaction; summarize the nerve operation mechanism of stress system and its pathogenic mechanism; analyze the essence and connotation of stress (stress); finally give the emotional adjustment method of stress.

1. Introduction

Stress response is a kind of adaptation to the changing internal and external environment, which makes the organism choose to fight or run away when facing danger and it is the original motive force for the survival and development of the biological world [1]. Various reactions to stress involve the overall balance of individual psychosomatic functions, and many problems in clinical medicine are actually the imbalance problem [2].

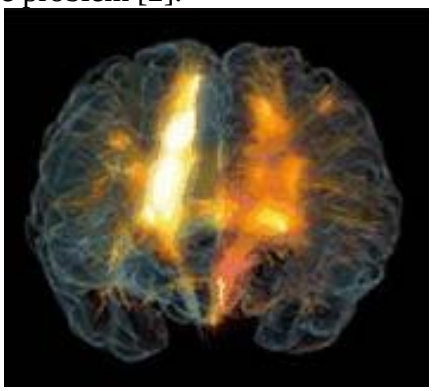

Figure 1 Ideas Are Represented in the Brain as Electrical Signals.

In the brain, every thought sends an electric signal throughout the brain (Fig1), every thought has its essential characteristics, they are objective, and the thought will have a certain impact on every cell in the body. Therefore, stress will make the electrical signal in the brain abnormal, and then trigger a series of reactions.

Stress can cause anxiety, post-traumatic stress disorder, depression and other emotional disorders. When the degree is light, it will cause the organism to be sub adaptive: fatigue, insomnia, loss of appetite; emotional instability, easy to fluctuate, anxiety, depression, but not pathological; sub healthy cognitive, absolutely thinking; further lead to subclinical stage (high risk to some diseases, chronic fatigue, recurrent infection, chronic diseases, the reactive ability decreased, adaptability decreased)

2. The Operating Mechanism of Stress System

Systems involved in the regulation of physiological responses to stress include[3, 4, 5, 6, 7,

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8](Figure 2): the sympathetic-adrenal medullary system; the autonomic nervous system; the hypothalamic-pituitary-adrenocortical axis; the endogenous opioid system; the hypothalamic-pituitary-gonadal axis; the renin-angiotensin-aldosterone system; the immune system; the limbic system; and the emotional brain regions of the central nervous system (CNS).

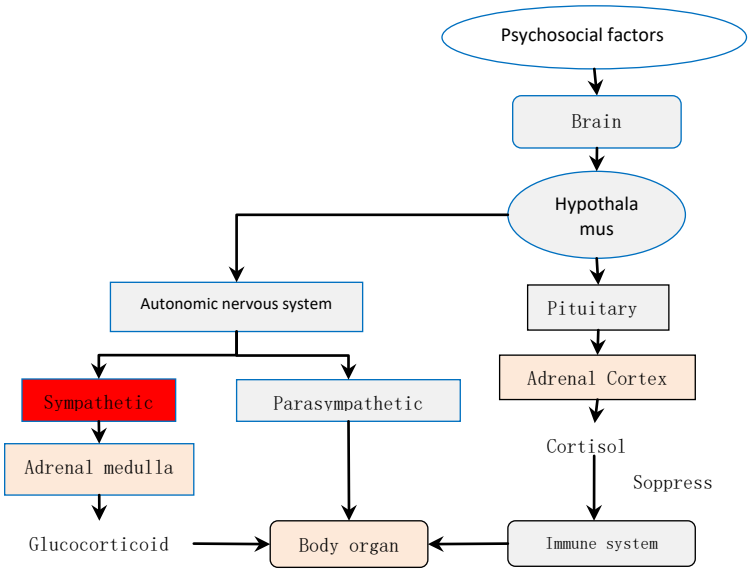

Figure 2 Main Nervous System Stress Process of Stress Response.

2.1 The Sympathetic-Adrenal Medullary System

Sympathetic excitation leads to glucocorticoid secretion from adrenal medulla. Glucocorticoid increases heart rate, blood pressure, and cardiac contractility; increases respiratory rate and tidal volume; increases blood flow to the brain and skeletal muscles; decreases blood flow to the skin and digestive tract; mobilizes fat, decomposes glycogen; and reduces clotting time. The purpose of all these reactions is to better adapt to fight or flight to get out of the immediate predicament.

2.2 The Hypothalamus-Pituitary-Adrenocortical Axis (Hpa)

Small cell neurons in the paraventricular nucleus of the hypothalamus secrete corticotropin releasing factor and arginine vasopressin, adrenocorticotropin releasing factor and arginine vasopressin through the pituitary portal vein to reach the pituitary, and stimulate pituitary secrets adrenocorticotropic hormone, which reaches the adrenal gland through the blood to promote the adrenal gland syntheticing and secreting the cortisol. High levels of cortisol can lower serotonin, make people depressed, and also damage the hippocampus, a brain area related to memory and thinking.

Renin-angiotensin-aldosterone system (RAS): Stress causes the aldosterone to rise, the kidney secretes the renin, through the circulatory system causes the angiotensinogen to be hydrolyzed to angiotensin II, raises the blood pressure.

2.3 Immune System

Stress can cause thymus, spleen, lymph node atrophy; T cells, B cells, NK cells and other immune cells decreased; the proliferation of immune cells decreased; cytokines decreased; specific and non-atopic immune response weakened; Cortisol increased and the globulin response decreased.

2.4 Limbic System

The limbic system (the brain tissue evolved from the paleocortex and the old cortex in the central nervous system of higher vertebrates and the general name of the neural structures and nuclei closely related to these tissues) includes a wide range of brain parts, such as the piriform cortex, entorhinal layer, orbital gyrus, cingulate gyrus, inferior gyrus of corpus callosum, hippocampal gyrus, insula, temporal pole, amygdaloid group, septal area, preoptic area, hypothalamus,

hippocampus and mammillary body.

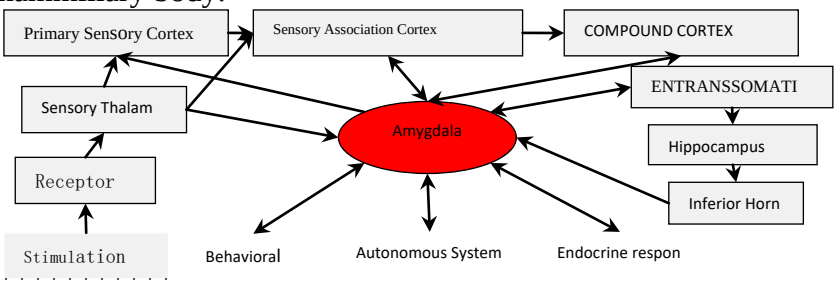

Figure 3 The Emotional Network

The limbic system is the main brain area of emotion production (Figure 3). The amygdala is the executive part of stress response, responsible for emotion production and the regulation of HPA axis. The hippocampus is the brain area of learning and memory, the integration part of stress response, also involved in emotion production. The memory function and the special distribution of corticosteroid receptors in hippocampus are the material basis of stress response. The prefrontal cortex inhibits the activity of the amygdala, and fMRI evidence shows that depressed patients have lower left prefrontal cortex activity, which weakens the inhibitory function of the amygdala and affects the emotional control of depressed patients.

The fight-or-flight action during stress is performed primarily by the autonomic nervous system, which includes the sympathetic and parasympathetic nervous systems, which act as antagonists, and the sympathetic nervous system, which prevails during stress.

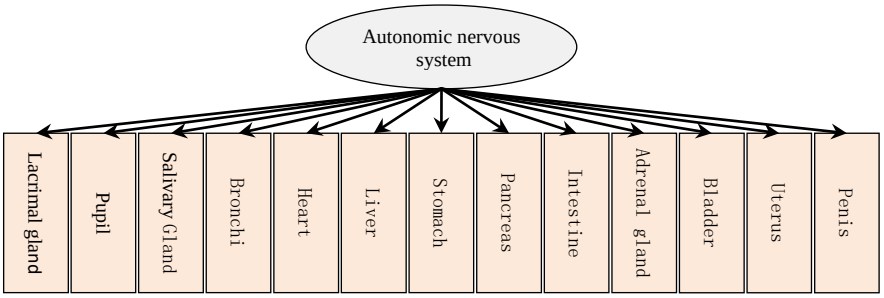

Figure 4 Body Organs Controlled by Autonomic Nervous System

A series of changes will take place under sympathetic nerve regulation during stress(Figure 4): the lacrimal gland inhibits lacrimal gland secretion, pupil dilation, eye fissure widening, exophthalmos; the salivary gland secretes viscous saliva; sympathetic nerve excitation causes vasoconstriction of unimportant organs, muscle vasodilatation; heart rate is accelerated, breathing is accelerated, bronchiectasis, skin erector pili contraction, sweat gland secretion, inhibits gastric and pancreatic movement, and intestinal and bladder is inhibited; liver decomposition of glycogen increases blood sugar and reduces insulin. Pregnant uterine contraction, no pregnancy uterine relaxation; urinary detrusor relaxation, sphincter contraction inhibition of urination; angiotensin and vasopressin to increase blood pressure and vasoconstriction, so if patients with hypertensive diseases or cardiovascular and cerebrovascular ischemic diseases, easy to induce serious pathological changes in sympathetic nerve excitation. Long-term stress can damage the organs connected with the sympathetic nerve, which may lead to coronary heart disease, high blood pressure, diabetes, asthma, peptic ulcer and functional gastrointestinal diseases, tumors and other physical and mental diseases.

Stress not only causes physical and mental diseases, but also damages the brain and causes some functional disorders of emotional abnormalities (depression, anxiety, etc.). To treat these abnormal emotional diseases, we need to constantly pay attention to our way of thinking. Unfortunately, while we are constantly watching our thoughts, no one is providing us with a formal place to teach us how to properly direct our thoughts. Many people do not understand the importance of thinking and let their own way of thinking go. If your mind is filled with negative thoughts, there is no doubt that they will affect the deep limbic system, and naturally there will be symptoms of upset,

depression, and irritability. The most effective way is to learn to actively control and guide your thoughts in the right way.

3. Analysis of the Essence and Connotation of Stress

Stress is a cognitive and behavioral process that is made up of psychological stressors and psychological stress reactions. Generally, stress is the negative feelings and negative beliefs that a person has when he feels unable to cope with the requirements of the environment. The causes of stress are related to both stressful events and individual perceptions of stress, with the same event causing stress to some people and not to others. The differences between individuals lie in personality, cognitive evaluation, coping style and social support, which are related to the frequency of subjective events and the judgment of negative events. The cognitive style of people susceptible to stress is usually absolute, pursuit of perfection, cynicism, partial generalization, negative bias and disaster; the personality characteristics are usually neurotic, easy to experience or feel negative emotions; the economic status is low, social status is low, social support is low. However, most of the pressures we feel in real life do not come from actual stressful events, but from: ① Unreasonable imagination: The pressures most people face do not come from terrible reality, but from terrible imagination; ② Inappropriate comparison: Different age stages of life and different industries often envy each other, unreasonable comparison is often the source of pressure.③ Not good at transposition thinking: pressure often comes from the trap of self, does not intend to transposition thinking with others, empathy ability and empathy are not developed enough.

4. Stress Coping-Emotional Therapy

Stress coping has rules to follow, coping is to follow the principles of correct understanding of oneself, establishing good interpersonal relationship, stabilizing emotions, adopting reasonable cognitive style, coping should be moderate, action should be orderly, step by step, and comprehensive coping strategies.

Stress coping is a process that includes steps such as: awareness of physical and emotional conditions, self-assessment of stress and stress coping strategies. Recognizing and learning it helps us to deal with stress in an orderly and structured way, without being flustered or overwhelmed.

First, you must be aware that your thoughts are real. Your mind is wired with thoughts, your brain releases chemicals, and a charged signal passes through your brain. Understand what you are thinking. These thoughts are real and have a real impact on how you feel and act.

Second, pay attention to how your feelings and thoughts affect your body.

The body feels uncomfortable when you have fear, anger, guilt, sadness and other negative thoughts in your mind. This is because that negative thoughts release chemicals in the brain that affect the body’s feelings and also stimulate the deep limbic system. Most people experience muscle contractions, heart rate increases, sweaty palms and even dizziness when they are angry. When every negative thought occurs, the body reacts sensitively.

When you have thoughts of happiness, joy, hope and love in your mind, as well as thoughts of kindness and peace, the brain produces chemicals that make the body feel good and calm the deep limbic system. When most people are in a good mood, they experience muscle relaxation, a steady heartbeat, dry palms, and relatively peaceful breathing. When you have positive thoughts in your mind, your body reacts in the same way.

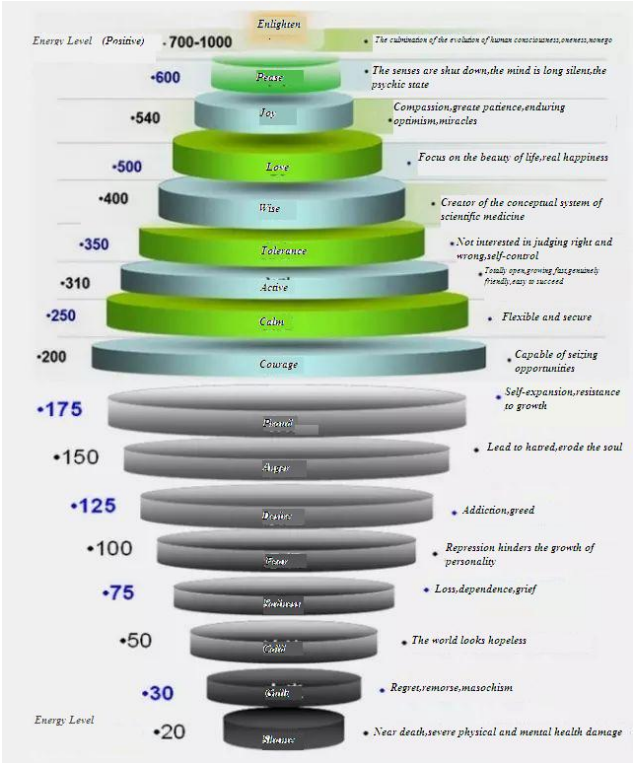

Figure 5 Energy Hierarchy List of Emotions

Third, realize that negative thoughts are a form of pollution. The power of thought is so powerful that it can make you feel good or bad (Figure 5). Every cell in the body is affected by every thought in the brain. This is why the body often experiences symptoms such as headaches and stomachaches when you are in a bad mood, and light and pleasant when you are in a good mood.

Unconscious thoughts are not necessarily consistent with reality. They can sometimes be deceivers, so do not be afraid to confront your negative thoughts. You can subconsciously cultivate your thoughts and move them in a positive and hopeful direction. You can also ignore them and let them hurt your soul and body. You can also learn to change your thoughts and thus change the way you feel. One way to change your mind is to fight back as soon as you see the negative nature of your thoughts. If you notice a negative thought and don't pay attention to them, your mind will acquiesce, and your body will respond accordingly. If you find a negative thought and correct it immediately, its impact on you will collapse, and our relationships, self-esteem or personal strength will not be damaged.

Write down negative thoughts first and then fight back. Some people may feel as if they are deceiving themselves. This may be because their minds are already set in their minds: whatever comes to mind must be true. In fact, we are sometimes deceived by thoughts, so be sure to examine them carefully before believing them.

Patients with obsessive-compulsive disorder, depression and various mental illnesses have special circuits in their brains [9, 10], which are established in Buddhism called as delusion, and once delusion occurs, the more you think about it, the more the circuit deforms. At this time to understand that the brain sometimes although very good but there will be times to deceive themselves, at this time to take their emotions seriously, understand that this emotion is false, believe in their physical feelings, the body does not like the emotions should be ignored. In the face of various emotions and thoughts, we should allow its existence, even if you think of the worst possibility; the emotions that the body does not like should be ignored. Allow it to exist in the face of all kinds of emotions and thoughts, even if you think about the worst possibilities, and keep it unanswered in your heart. The more you focus on it, the stronger your emotions and feelings will be, and the more you will ignore it, the more it will fade away. For example, a person with depression and anxiety is always worried about this and that, but know that these worries are reasonable and logical, and sometimes even possible, but we need to understand that these are delusions, are false,

do not devote their attention to them, so that many thoughts will die on their own. It is important to understand that depression and anxiety make your brain produce false thoughts, so that you can really understand them and get out of them.

5. Conclusions

Moderate stress can arouse positive psychological reaction, that is, moderate cortical arousal level and emotional arousal, attention, positive thinking and motivation adjustment. This reaction is conducive to the correct cognitive evaluation of incoming information, coping strategies and coping ability. Excessive pressure or low psychological energy will cause negative psychological reaction, that is, excessive emotional arousal or depression, cognitive ability is reduced, self-concept is unclear. This kind of reaction hinders the individual from correctly evaluating the real situation, choosing coping strategies and influencing the exertion of coping ability. Therefore, recognizing the essence of stress and adopting moderate stress coping methods can avoid serious physical and mental damage.

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