

STRESS, ADAPTATION AND THE POSSIBLE EFFECT OF PHYSICAL EXERCISE

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Marina Kostić

Faculty of Philosophy, University of Niš, Niš, Serbia

Abstract. *All the categories of body feedback to stress arise from the disbalance between the stressor, on one hand, and the body resources available in overcoming stress on the other. If psychological stability is not at an optimal level, it causes the body homeostasis disbalance, physiological stability is damaged which leads to psychosomatic signs and diseases as the result of stress. As the key organ in overcoming stress, the brain has a significant role in adaptation to stress. That is why the scientists stress its potential and ability to regenerate and to provide the body with the potential to overcome the consequences of stress. In order to prevent and reduce the consequences of the influence of the stressogenic stimuli on the body, the way man can improve his quality of life and body health should be taken into account. Physical activity is one of the ways of achieving that goal, and the fact regarding the positive influence of physical exercise on the health and the emotional status of the body is well known and has been confirmed scientifically in many medical and psychological studies. The aim of the paper is the influence of the analysis which stress can have on the brain and the body and the synthesis of the results which confirm the importance of physical activity in everyday life, and especially under post stress circumstances, that is, while adapting to stress. The effects of physical exercise, as a measure of prevention, influence the optimal health status of an individual, which indirectly improves the function and the efficacy of exercising. Advances in neuroscience have tasked experts with using their knowledge and findings about the positive influence of physical exercise in order to better understand all the aspects of adaptation to stress and the reestablishment of the body homeostasis.*

Key words: *stress, physical exercise, psychology, analysis.*

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Corresponding author: Marina Kostić

Faculty of Philosophy, University of Niš, St. Ćirila i Metodija 2, 18000 Niš, Serbia

Phone: +381 18 514312 • E-mail: markost79.mk@gmail.com

THEORETICAL CONSIDERATIONS

Hans Selye, a well-known Canadian scientist of Hungarian origin (Selye, 1950, according to Nešić, 2005) interpreted the influence of “detrimental agents” such as body “strain” which he observed in his endocrinological experiments. He injected different stuff into mice organs. He saw the common effects in these experiments and called them the “general adaptation syndrome” (GAS), which became the widely known theory of stress. Apart from numerous reviews and additions, this theory of stress is the basis and the reason for much research and many theories as a real and anticipated threat to body stability which causes its reaction at the physical, body, psychological and social level. The influence of threatening external factors and life events on the human body against the natural inborn tendency for physiological stability preservation in the face of the changes that occurred, the so-called allostasis, includes the whole cycle whose ultimate effects depend on genetics, experience, individual capacity and perception, the stressor assessment as a potentially “dangerous” factor as well as the behavior, that is, the style and the way of life which means: the rhythm and the “burthen” of everyday commitments, the way of eating, sports activities or physical activity in the sense of recreation. When the brain perceives the experience as threatening, there are physical and behavioral reactions whose aim is adaptation and allostasis; however, when the exertion becomes more intense because of prolonged exposure to the neural, endocrinological and immune stress mediators, the negative influence will affect the function of the different organ systems leading to illness (McEwen, 1998, according to Nešić, 2005).

Model: body-stressor, damage-disorder of the function of the organ-symptom of an illness is very simplified, but represents the “skeleton” which reflects the mechanism of the origin of the disorder under the influence and the accumulation of negative emotions (Silver & Wortman, 1981) and the negative psycho-social circumstance with the key role of the psychological body disorders during the pathology evolution of the organs.

There is a distinction between chronic body disorders and classical psychosomatic illnesses because the former emerge through the joint action of the whole spectrum of factors which are in a dynamic relation, and the latter is the result of the predisposition by the inherited genetic and social factors with the stress on the psychological component – the negative emotional state and the negative emotions. However, in both cases the psychological state influences the course and the outcome of an illness: despair and hopelessness are enhanced, but optimism and the will for life strengthen the defensive body power and improve the health of an individual (Nikolić & Žikić, 2012).

The aim of the paper is to analyze the influence which can be produced by stress on the brain and the body and the synthesis of the results which confirm the significance of physical activity in everyday life, especially in post stress circumstances, that is, the adaptation to stress.

THE BODY REACTION TO STRESS ADAPTATION

The review of the recent psychological literature points to the fact that in the past few decades, there has been significant progress in the approach to stress research in the sense that focus has shifted from the theoretical, physiological, immune and neuro-endocrinological frame to the research of stress effects, that is, the mechanisms which will be the result in the defensive phase. Above all, these are overcoming and adaptation, and it is essential to see the difference between these two mechanisms. The shift in research and analysis results

from the gradual overcoming of the pathocentric orientation and direction to psychological research and the study of the positive aspect of human functions and existence, that is, psychological conditions and behavioral stress manifestations. It is important to mention here the concept of positive psychology, that is, the scientific examination of the optimal human function, whose aim it is to find and stimulate the development characteristics which make it possible for individuals and communities to have a successful life and prosper (Zotović, 2002).

One of the definitions which Lazarus suggested (Lazarus & Folkman, 1984, according to Zotović, 2004) determines the overcoming of everything which a person does on the cognitive or behavioral plane in order to solve problems and/or reduces the intensity of the psycho-physiological reaction within the stress process. There are other definitions by this author in his works from the field of overcoming, but for the above given it could be said that it is widely accepted. It is obvious from the definition that overcoming has two functions: problem solving and emotional regulation. The cognitive assessment of this situation is the basis and “the trigger” of the process of overcoming because without the assessment of the situation as dangerous there is no experience of stress (Lazarus, 1986). Facing the change, the person starts the process of primary assessment in order to determine the significance of the stressor; so, it is not about a simple reaction to the stress effects but about the assessment of an individual to see if the new circumstances caused by the psychosocial stressor can overcome his/her abilities and the abilities of successful confrontation (Miljković, 2005). The overcoming refers to bodily strain which might not be visible (cognitive as well) in order to overcome the injury, threat or challenge successfully according to the secondary assessment which refers to the assessment of the personal potential, abilities and resources in order to overcome the crisis. With active overcoming, the person approaches the very stressor or emotions related to it, while with passive overcoming the person tries to distance himself from the stressor and the following effect (Connor-Smith & Compas, 2002). So, the overcoming is observed as a special category of adaptation which appears in normal individuals and circumstances which contain unusual requirements, they represent unusual burthen; the key criteria are: the features of the event and the subjective assessment of the event by the person experiencing the stress (Zotović, 2004). However, one should bear in mind that cognitive assessment and overcoming are not one and the same thing: “...Overcoming refers to everything the person thinks or does in order to overcome the requirement; and assessment is the evolution of everything which could be thought of or done with the same aim” (Lazarus, 1991; p. 113).

NEURO-PHYSIOLOGICAL ADAPTATION AND “BRAIN PLASTICITY”

The basis of the neuro-physiological reaction contains the hypothalamic-pituitary-adrenal axis (HPA axis), which makes the connection between the central nervous system and the immune system. With the appearance of the stressogenic stimulus, the brain accelerates the concentration of the adrenocorticotrophic hormone (ACTH) which further stimulates the adrenal gland and then the manifestations appear: the changes in the cardiovascular tone, respiratory distress, visceral/somatic pain, infection, inflammation, etc. Schaffer (Schaffer, 1954, according to Nešić, 2005) has postulated the neuro-physiological hypothesis of behavior under stress according to the study of decorticated animals which stresses the consequent behavior under stress in the direct connection to the subcortical processes. The physiological reactions mean the activation of the sympathetic nervous

system when the blood pressure is high, when the pulse is pounding, when the heart rate and the breathing are high, when there is electrical skin conduction, when the whole physiological body and the metabolic function is activated by the mineral glucocorticoid secretion in order to be adapted to the stress state. The endorphin and the enkephalin secreted by the brain attacked by the negative stimulation have the task to activate the immune system to the stress reaction, except in the case of prolonged stress situations when the endogenous elements will have counter-effects, which are the weakening of the immune system and the secondary appearance of various illnesses as the result to stress exposure. It should be stressed that physiological body reactions can be interpreted in a positive, protective and defensive context for the body, which also has to do with physiological adaptation.

If a person perceives a certain situation as real or potentially dangerous, an intensive sympathetic nervous system comes into being (the blood pressure increases, the heart and the breathing rate are high, the skin conduction is higher, etc.). The stressor reaction in the hippocampus influences higher excitability and amplifies cortisol and other stress hormones (Franin, 2014). The essence of the adrenal gland secretes catecholamine: adrenaline and noradrenaline, which increase the body's physiological activity and they can secure greater energy availability in the moment of crisis (Obrenović, 2005). At the same time, there is the slow HPA-axis reaction, the adrenal gland cortex secretes cortisol whose aim is to put out sympathetic activation induced by stress the moment the immediate threat disappears. In that way, the body retrieves its balance and normal functioning. Prolonged stress exposure can affect the body in a very negative way because it leads to "stress adaptation", there is no recovery and the return to the state before stress. The HPA-axis has been exhausted and the anti-stress protection is low. Some authors claim that the length of stress exposure is more significant than the intensity of the stressors (Miljković, 2005). Synoptic discharge with the visceral and motoric reaction is coordinated and represents an acute stress response. However, it is important to emphasize that there are numerous biochemical, physiological and cognitive changes in the body which could be manifested by changes in behavior in order for the body to respond appropriately to the new situation which is experienced as a threat – threatening and potentially dangerous. That is why the course and the outcome of the psychological adaptation is very important for body recovery and the further body functioning.

The "plasticity" of the brain refers to the ability of the nervous system to change its structure and its life function and its response to the changes around it. Though this term is used in psychology and neuroscience, it is not easy to define and it refers to the changes in the genes expression, the changes in behavior (Kolb, Muhammad, & Gibb, 2010). Early post-natal plasticity is of essential significance which means the continuance of the intrauterine developmental processes of the brain even after the birth, especially in the first months (Mejaški-Bošnjak, 2007), when there is an intensive synoptogenesis – which results later in the doubling of synapsis with the cortex of the two-year-olds in relation to adults. Chronic stress is one of the main causes in the hippocampus; the significant changes of the nervous function, the disorder of behavior, anorexia, sleepiness, dementia, even neuron destruction could be the result of the cytokine reaction in the central nervous system under stress (Reichlin, 1993, according to Nešić, Čičević, & Nešić 2012). The studies show that the lesions of the CNS, for example, in the pre-frontal, basic regional ganglions, paralimbic, limbic, the thalamus and the brain stem cause changes to that effect. The famous case of Gage (Phineas Gage) from 1838 is the example how damage to specific parts of the brain influences the change of cognitive and emotional behavior, so that today we talk about effect and memory as the "functions of the limbic system". However, the most important

moment in this context are discussions about the influence of experience to brain changes which can lead to the changes of the nervous system of adults (playing the piano every day for two hours will lead to the increase in motor ability of the finger muscles after five days and there is an improvement in performance (Pascual-Leone, etc. 1995, according to Nešić, 2012). That is why there is a dominant hypothesis that plasticity is the significant inner characteristic of the nervous system through life, that the brain changes continually in response to the sensory stimuli, the motor act, associations, reward signals, the action plan, or consciousness (Pascual-Leone et al., 2005, according to Nešić, 2012). The dynamics of the origin of the new nervous cells has especially been studied, and it was shown that it is related to stress and the hormone reaction to stress. The hypothesis is that the new neurons improve the brain ability to fight stress (Gajović, 2012), which will be discussed later.

In the case of brain injury (stroke, epileptic seizure, meningitis), the number of new neurons increases. Experimental strokes with mice point that neurons originating in the subventricular brain zone divert from the rostral migratory path, and go to the damaged area, and exactly that feature of the new neurons shows that they could have an important role in recovery after brain injury or illnesses (Gajović, 2012).

According to one of the classifications (Kolb & Gibb, 2011), the three main forms of plasticity are: synaptic plasticity, neurogenesis and the functional compensatory shape. Plasticity refers to all the ways in which the brain changes, including the changes following damage and changes in behavior. The brain is the key organ in the stress process: it determines what the body will experience as stress, how the body will deal with stressors, it changes functionally and structurally as the result of stress controlled by the physiological, psychological, cognitive, emotional and behavioral body reactions to stress. This two-way signalization, that is, the communication between the body and the brain takes place through the short-term mechanisms (alostasis), and the long-term ones which are maladaptation under stress and the patho-physiological body reactions to stress circumstance with a direct influence on man's mental and physical health (McEwen & Gianaros, 2011). The brain processes, plasticity, depend on the stimulus from the external surroundings and inner ones influencing the alostasis as the basis of the body homeostasis. The mechanisms of alostasis are the key in sudden stress situations, but if their influence is prolonged they negatively influence mental and physical health, primarily because of the negative effects. Both mechanisms are related to expectation and the stressor assessment, concern, anxiety, cognitive preparation and are related to the loading of alostasis which is additionally increased by smoking, alcohol consumption, the style and the quality of an individual's life, etc. (McEwen & Gianaros, 2011).

The adult brain has greater plasticity ability than it was thought earlier (McEwen and Morrison, 2013), which is very important for planning behavioral and pharmacological therapy in the future. Regeneration means the creation of new synapses and new neurons, that is, glial cells which could replace neurons (Rajkowska, 2000; Stockmeier et al., 2004, according to McEwen and Morrison, 2013). During their life time, a certain number of neurons die away and in that context apoptosis should be mentioned – “the programmed death of cells” which could be the result of the weakening or the lack of (positive) signals necessary for cell survival or for correcting “wrong” connections between neurons (Žlender, 2003). It is important to mention that the pre-frontal area and the functions of the healthy brain are liable to change under the influence of experience; for example, researched showed that the lack of sleep stops the appearance of new neurons (Gajović, 2012). Regular aerobic exercises could give good results, especially with older people, in terms of better blood circulation in the pre-frontal and parietal cortex (Colcombe et al.,

2004, according to McEwen and Morrison, 2013). The physical activity and the exercise accelerate the appearance of new neurons (Gajović, 2012); that is why it is very important to do physical exercise in everyday life.

PSYCHOLOGICAL ADAPTATION

From the point of view of the stressor, the response, or the process, stress is a widely defined concept which stereotypically has a negative connotation for the human body, though it is sometimes necessary in mild form for regular individual development. A person will develop his/her own mechanisms of adaptation at the cognitive, physical, emotional and behavioral level when he/she is stimulated by his/her own efforts, difficulties and mild frustrations (Obrenović, 2005). Within that context, there are two types of stress: eustress, as a positive, constructive and “comfortable” type of stress (falling in love, child birth, getting a reward, unexpected material gain, etc.) or distress – a harmful type of stress which leads to disintegration and body damage (death, or the disease of a loved one, divorce, the loss of a job, etc.). In both cases, it is important to make the locus of control which will enable and accelerate the process of adaptation in order to make up for the wasted energy above optimal body limits, because the accent is on the body’s state and on the conditions to which a person is exposed to (Obrenović, 2005). In the last couple of years in the research related to the types of personality and the response to stress, special attention is paid to the adaptation and the emotional control to stress. An American psychologist, Richard Lazarus (Zotović, 2002), who is the author of the transactional theory of stress, points to the fact that the basis of every stress experience is a special relation between a person and his/her own surroundings. This mutual relationship is established between the cognitive assessment of the events (Zotović, 2002). The transactional approach emphasizes that stress is a process, and not a state of the external surroundings or the state of the body, so that the most important characteristics of stress according to this definition are: the external event or the situation, the characteristic subjective assessment of the event, the changes in psychological functioning, physiological changes and the experience of the whole process. The process of adaptation is determined by these components.

The most significant life events (stressors), the events of crisis or changes in life which could trigger a stress situation in the body are: problems in marriage, common-law marriage, the relationships between children and parents, conflict at work, the loss of a job and unemployment, the loss of a loved one, the loss of social support, natural catastrophes, injuries (traffic, or at work), war conflicts, insufficient financial support for life, legal problems, as well as adolescent developmental problems (Kristensen, Kornitzer, Alfredsson, & Marmot, 1998).

The stressors are stimuli (physical, chemical and psychological) which burthen the body leading to a string of problems of the body and the personality. The stressor can be: extreme physical and social effects in the community, catastrophes (universal stressors) and big life events (personal stressors) and are followed by an experience of uncertainty, danger or existential threats. They can cause: physiological, psychological, cognitive, emotional and behavioral body response (Obrenović, 2005). It is considered that they can have a defensive, that is, protective role for the body. However, the very experience of stress is a better criterion than the very events to which a person is exposed to (Cohen, Kamarack & Mermelstein, 1983).

Today, it is a very frequent situation to interpret the medical diagnosis in health institutions as stress induced, which poses the question: how and according to which criteria do we differentiate “normal” life experience from stress, that is, what consequences to health do we expect? By analyzing research on stress and by summarizing the psychological theories, one can conclude that the subjective assessment of the situation and the events when it includes threat, loss or challenge, is a sign that a person experiences stress. It should be taken into account that these assessments of the same situations by different persons will be different, and that the person in a situation of a different intensity of stress will respond in a different way, depending on his own subjective threat, i.e., danger, assessment.

PHYSICAL ACTIVITY AS A POSSIBLE MEDIATOR FOR STRESS ADAPTATION

Physical activity represents a planned controlled exercise which is repeated in order to maintain and improve one or more physical components of readiness (Arsić, 2012). Numerous clinical studies show that moderate and regular physical activity has a strong positive influence on human health in the sense that it positively influences the entire health of a person, increases his/her functional capacities and quality of life and takes part in the prevention of many metabolic disorders such as obesity, diabetes type 2 and arteriosclerosis. There are many different mechanisms by which physical exercise influences the body functions beneficially (Endres et al., 2003). The data compiled by the SZO for the European region as a whole cite that one out of five persons does not practice any physical activity, that physical inactivity is the cause of 600.000 cases of death in the region annually (5-10% of the whole mortality rate, depending on the state), that it causes early death and health problems, it threatens to become a global problem, from the point of view of a child through all the layers of age and social structure (Petrović-Oggiano, Damjanov, Gurinović, & Glibetić, 2010). Both personal experience and medical science confirm that the lack of physical activity negatively influence the individual's health status, and the body's recreation in any form is important in the prevention and in the process of removing the consequences and symptoms of stress, which can be confirmed by the results of much research. Some sources cite the data that the positive effects of exercise can be seen in the form of an increase in self-efficiency, a change in the concept of self, diverting attention from negative thoughts and feelings, the experience of success and the increase in self-confidence (Strohle, 2009).

The relation of physical exercise to the reduction of depression and anxiety is the topic of much research and meta-analysis. The sample of research is heteronymous and the results of some studies were contradictory (Živković, Mitić, & Bubanj, 2011). There are several studies done in this field (Fox, 1999), three of which are interesting; the effect of “short” exercise on anxiety was determined – acute and temporary when the more moderate effects of anxiety reduction can be seen after intensive aerobic exercise, such as running, for example. Secondly, the effects of physical activity within an exercise program lasting for several weeks have been researched and determined, which have influenced the state of anxiety as well as the people who already suffered from anxiety. Reductions are shown in both cases. Thirdly, the effects of individual exercise sessions and the program of exercise have been tested by measuring the psycho-social and psycho-physiological response to the effect of an additional psychological stressor as the solving of a complex mental task in public. These studies show ambiguous results or benefits from physical activity for half of the participants, which can be interrupted as the result of potential errors in measuring.

In the research related to the positive influence of high intensity aerobic exercise on the reduction of stress influence on anxiety and depression, authors obtained results which emphasize that adolescents who were physically more active were less stressed and had a lower level of depression (Norris, Carroll, & Cochrane, 1992). The authors divided the participants into groups in the following way: one group had high intensity exercise, the second – medium, the third exercise of flexibility, and the control group – none of these. The training sessions took part two times a week for ten weeks and after that period the first group of participants reported a lower level of stress and a “weaker” connection between stress and anxiety on the one hand, depression and hostility on the other, as related to the achieved psychological and physiological parameters of all other groups. Those who exercised actively reported a lower level of stress and a lower level of depression after ten weeks of regular training while the measured psychological and physiological parameters significantly differed from the group which was exposed to intensive aerobic training. It is interesting that the correlation between stress and anxiety (depression) is significantly lower in the group of the very physically active participants – adolescents (Norris et al., 1992).

Physical activity and exercise have positive effects on younger and older generations because apart from affecting body weight, they directly influence the reduction of risk from several chronic diseases: coronary disease, hypertension, diabetes mellitus among people dependent on insulin, they reduce anxiety, depression, the physiological functions of the body and general weaknesses (Polidori, Mecocci, Cherubini, & Senin, 2000). Among the fifteen-year-olds, according to the data of a sample of 1690 participants (Haughland, Wold & Torsheim, 2003), which examined the relation between school stress, physical exercise during leisure time and the adolescents’ complaints about health problems, the study showed that the complaints of younger people are more frequent when the level of stress is higher and the leisure time is shorter. So, more physical exercise reduced the influence of stress and the frequency of complaints of young people about health problems.

Physical activity is often recommended as one of the most efficient strategies to control stress; that is why we talk about physical activity as a mediator for stress adaptation. Though clear correlations are made between stress, physical activity and overcoming difficulties between children and adults, they were not studied enough among students. However, the existing research has indicated the following contradiction: though physical activity helps students to face stress and difficulties more efficiently, it suggests that students and other young people do not respect and accept the recommendations to do physical exercises (Nguyen-Michel, Unger, Hamilton, & Sprujit-Metz, 2006). Most of the existing literature is based on the correlation between physical activity and post-social well-being, which is reflected through psychological stress and dissatisfaction. Some studies show the effects of exercise on the temporary reduction of stress level and anxiety, that is, people who are physically more active are more resistant to the influence of psycho-social stressors (Schnohr, Kristensen, Prescott, & Scharling, 2005). It is interesting that sports coaches, who are not in sport anymore because of some crisis in life, have greater average results in relation to – Negative emotions and stress (Sindik & Missoni, 2012).

Can physical activity reduce the depression caused by stress and influence the immune system? It is considered that it could alleviate the negative influence of stress on the behavior and the acquired immune system response. Health problems such as depression and anxiety, both closely related to stress, in the last couple of decades are appearing earlier among the younger population more frequently (Twenge, 2000, according to Nguyen-Michel et al., 2006). Stress and physical inactivity are a great health threat to the young population and the factor of risk increase from different illnesses in

their future, in the adult age, which points to the fact that innovative and efficient strategies for decreasing risk to health based on additional research on the cause and effect relations to physical activity and stress.

There is a clear correlation between psychological stress and a cardiovascular reaction; it is well known that chronic psychological stressors can lead to higher risk of arteriosclerosis, hypertension and different metabolic disorders (Chrousos, 2000b, 2009; McCrone et al., 2001; Kyrou and Tsigos, 2009, according to Huang, Webb, Zourdos, & Acevedo, 2013). It is believed that physical activity regulates the body's response to the level of rest, which is shown in the research as a higher intensity of exercise because during exposure to stress the heart rate is lower than in physically inactive individuals (Clayton, 1991; Boutcher and Nugent, 1993; Spalding et al., 2000, according to Huang et al., 2013). These studies focused on the thesis that psychological stress can be reduced by the influence of some factors, one of which is regular physical activity; as a matter of fact, it has been shown that physical activity gives psychological benefits to the individual which could be compared to the benefits which bring about traditional anxieties (Petruzzello et al., 1991, according to Huang et al., 2013). Further, Raglin (1990 according to Živković et al., 2011) analyzed the research effects of physical exercise to psychological health and cited that some research showed that exercise, but only aerobic exercise, can have similar effects in the clinical population as a standard form of psycho-therapy, while in healthy individuals can have an important role as factor of prevention. Consequently, we can talk about physical activity as an important factor of anti-stress protection in the body.

Regular physical exercise has a significant role in body resistance to oxidative stress; the production of free radicals and oxidative stress increase intense aerobic physical activity, and increased aerobic metabolism during physical activity is a potential source of oxidative stress (Stanković & Radovanović, 2012). Generally speaking, the immune system has a positive adaptation to physical exercise, and a more resistant immune system is an automatic guarantee and an increased resistance to stress. It could be said that exercise is the moderator for stress-illness relations, that is, that stress to a smaller degree causes physical and psychological symptoms visible among physically active individuals. While attempting to determine more efficient physical exercise or a more "difficult" aerobic activity, the result give priority to the first ones – if you consider the effects on the state of anxiety caused by stress, while positive effects in the state of depression were not determined in the research (Carmack, de Moor, Boudreaux, Amaral-Melendez, & Brantley, 1999). A particular finding from this research is interesting and it refers to physical activity prior to stress exposure which could reduce depression and reduce the immune system's response caused by stress (Moraska & Flesher, 1999).

However, one cannot think only one-way. One of the meta-analyses of the current research of physical activity on young people under the age of twenty years, which comprised sixteen studies with 191 participants, shows that the effects of exercise are relatively small and there is no difference between the effects of intensive or less intensive exercise (Larun et al., 2006 according to Živković et al., 2011). Another study dealt with the examination of the relationship between exercise, personality traits and physical health (Yeung and Hemsley, 1997 according to Živković et al., 2011), where the participants were predominantly female and which shows that the positive effect of physical exercise exists, but is insignificant and explains that it is 6% of the whole variant of the prediction of a positive effect.

In contemporary literature, the dominant attitude is that overcoming is the mediator of stress, which means that stress and different disorders are not directly related, but stress

triggers some behavior which is related to stress results (Zotović & Petković, 2011). It could be said that the body's response to every stress stimulus is the a part in overcoming it, and the end-result is always body-adaptation; without overcoming there is no adaptation, and the disorder results from the varieties and efficiencies of the ways in which people respond to stress stimulus, that is, the ways in which people cope with stress.

It is interesting to wrap up the story with a fact about the interesting relation between the belief and the use and the benefits of regular physical activity for health; the belief about the importance of physical activity is a sign of these activities irrespective of gender or age, has been proved by research throughout Europe (Steptoe, Wardle, & Filler, 1997). The relation between a type of behavior related to the health and emotional well-being of the individual adds up to the recognition of the healthy way of life in many cultures. Mutual correlations and, very often physical activity-conditioned health point to the proper realization of preventive and promoting programs in many health institutions, education and social aid, in order to stress the importance of healthy style of life which means regular and moderate physical activity.

CONCLUSION

Bearing in mind the whole context of stress study as a psycho-neuro-endocrinological, that is, organic, cognitive, emotional and behavioral response of the body to stressor response, the analyses of consequences are done regarding their positive or negative quality and intensity. In such circumstances, mostly involuntarily, the person will face changes in the way of functioning and adaptation at one level, when the ways of stress response are important, the strategies of facing stress and the potential for its overcoming, its styles and the ways of overcoming. Regarding the fact that it is the 21st century, the significance of physical activity is emphasized as the essential element of human health and existence, as the prevention and the reduction of cardiovascular diseases, physical activity should be integrated in everyday life as a necessary and essential human need. The positive influence of physical health and the change of life habits should be stressed by way of promoting campaigns and programs. The generally accepted behavior is that moderate physical activity of the aerobic type, 5-6 hours a week, is beneficial for the body, because regular physical activity could change the quality of the blood vessels, and coronary damage can reduce and lessen it. According to the findings of some research, it could be stated that regular physical activity is an important factor which could improve the quality of life and positively influence the psycho-somatic status and health of an individual generally. Such strengthening of physical and mental health significantly prevents and alleviates possible consequences of the stress to the body, and a better and a more efficient functioning of an individual is conditioned by the adequate, optimal health status. The fact is that the positive influence of the active style of life and physical exercise is the subject of a number of studies world-wide; the reasons for this topic could be justified and necessary because in everyday life we encounter situations where organic and psycho-somatic symptoms and illnesses are explained and interpreted as the results of the influence of stressors. The therapy of physical exercise could prevent possible psychological therapy and medical therapy in the case of disorders caused by stress so that we could speak about it as a measure of prevention, but further research and findings are necessary to get the final opinion, to base the acquired knowledge, in order to define the mechanism which is at the basis of the possible positive effects of exercise used to overcome and adapt the body to stress.

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STRES, ADAPTACIJA I MOGUĆE DEJSTVO FIZIČKOG VEŽBANJA

Sve kategorije odgovora organizma na stres nastaju zbog disbalansa između stresora sa jedne strane i resursa organizma raspoloživih u prevladavanju stresa. Ako psihološka stabilnost nije na optimalnom nivou, dolazi do poremećaja homeostaze organizma, narušavanja fiziološke stabilnosti i javljanja psihosomatskih simptoma i bolesti kao posledice stresom narušenog zdravstvenog stanja osobe. Mozak, kao ključni organ u prevladavanju stresa, ima značajnu ulogu u adaptaciji na stres zbog čega se naročito ističe njegovo potencijalno svojstvo regeneracije i sposobnost da organizmu obezbedi potencijal za savladavanje posledica stresa. Da bi se sprečile ili umanjile posledice delovanja stresogenih stimulusa na organizam, treba imati u vidu na koji način čovek može unaprediti kvalitet svog života i poboljšati zdravstveni status organizma. Fizička aktivnost jedan je od načina za postizanje tog cilja a činjenica o pozitivnom uticaju fizičke vežbe na zdravstveno i emocionalno blagostanje poznata je, i naučno potvrđena, u mnogim medicinskim i psihološkim studijama. Cilj rada je analiza uticaja koje stres može imati na mozak i organizam i sinteza rezultata koji potvrđuju značaj fizičke aktivnosti u svakodnevnom životu, a naročito u post-stresnim okolnostima odnosno adaptaciji na stres. Efekti fizičkog vežbanja, kao preventivne mere, utiču na optimalan zdravstveni status pojedinca čime se, indirektno, poboljšava opšte funkcionisanje i efikasnost pojedinca koji vežba. Napredak neuronauke postavio je zadatak pred stručnjake da dosadašnja saznanja i otkrića o pozitivnom uticaju vežbanja koriste u cilju boljeg razumevanja svih aspekata adaptacije na stres i ponovnog uspostavljanja homeostaze organizma.

Ključne reči: stres, fizičko vežbanje, psihologija, analiza.