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Pedagogická fakulta

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V.**

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INFLUENCE OF NOISE AND VIBRATION ON THE ENVIRONMENT AND THE PSYCHOLOGICAL HUMAN CONDITION

Nadia Viter

Annotation

The qualitative specificity of the subjective attitude to the environment is investigated in the article. The system of environmental parameters and its typology is developed; the psychological characteristics of different types of attitude to the environment are studied. Variants of various strategies and technologies of human-environment interaction are explored and their typology is created. The study of human activities in the environment is conducted, the task of which is to apply the achievements of science, technology, the use of laws and natural resources to solve environmental problems.

Key words: environment, psychological characteristics, noise, ecological psychology.

Introduction

From birth, a person is in an ecological space and this space directly affects the life. Human activity is associated with the formation and destruction of the created space. How the person perceives this space, how builds the relationship with it, influence on her psychological and physiological condition. Everyone knows that poorly constructed ecological space (unclassified audience: tight, poorly lit, with suffocating air, poorly chosen colour scheme) has a negative effect on the mental state of the person, reduces working capacity. That is, human activity has a significant impact on the environment. An example of the negative impact on the environment is the Chernobyl disaster. It has shown a negative impact on the ecological state of the environment on a planetary scale. The consequences of which are studied not only environmentalists and radiologists, but also physicians, biologists, sociologists, psychologists. The psychological consequences of the Chernobyl disaster are being studied by psychologists working in various fields of psychology: social, medical, radio ecological and environmental psychology.

Employees of the laboratory of ecological psychology of the Institute of Psychology of the Academy of Pedagogical Sciences of Ukraine believe that in the eco-psychological approach, only those environmental factors that are directly related to the sphere of human activity should be separated, and people are also aware of important factors that should be taken into account when organizing their life [1].

The subject of ecology is in the relationship of living organisms, the impact on them of the environment, in particular human, and the possible negative consequences. Man, on the one hand, is a part of nature, and on the other, the most important part of it, is able to influence nature positively and negatively. Therefore, the concept of "human ecology" emerged, and eventually a new science – ecological psychology – was formed. Ecological psychology is the science of the psychological aspects of the relationship between man and the environment (natural, artificial, social, cultural), which is organically incorporated into human life and is an important factor in regulating its behaviour and social interaction. The environment is a system of various factors that influence a person's lifestyle and mental activity. Such factors are biogenic, anthropogenic and social factors. Biogenic factors are natural – geographical: air temperature, solar radiation, natural landscapes, sounds of nature. These factors affect the human psyche both positively and negatively. Anthropogenic environmental factors include man-made factors such as architectural structures,

urban landscapes, living and working spaces, noise, vibration, music, radiation, polluted air, water, soil. These factors negatively affect the mental and somatic condition of the person. Social factors of ecology are specific factors. They belong to both biogenic factors, since man is a natural being and anthropogenic. Because humanity is not only a powerful force that influences the environment, it is a creative force that changes itself and forms various socio-ecological systems. Therefore, society is a part of the environment and its condition depends on the activity of the society [2; p. 152].

Psychological peculiarities of noise and vibration

The environmental factor that directly affects humans through the hearing aid is noise. It can be of biogenic and anthropogenic origin. Biogenic noise is the sounds of nature that have a favourable or neutral effect on a person's psychological state.

Otherwise, anthropogenic noise – the noise of machines and equipment – has an effect on the human psyche. Such noise has been proven to have a negative impact on humans. It increases aggressiveness, reduces performance, attention and desire for cooperation. The intensity of noise reaching dangerous levels is detrimental to the physical and mental health of the individual.

There are a number of methods by which one can determine how human behaviour depends on a number of influences of natural and artificial factors. A variety of variants of human behaviour under the influence of environmental factors can be demonstrated by noise and vibration. A person who suffers from a loud noise will usually try to resist his actions. It can either turn off the noise source by actually changing the environment, or try to adjust to it, use headphones, do some other work, or even leave the noisy place [4]. It is established that the more actively a person can control the noise, the quieter he treats him, the weaker his negative influence on the psyche. Most of all, noise prevents those who are under its influence and cannot do it.

The saturation of modern production with machines and mechanisms is accompanied by intense noise and vibration, which negatively affect the health and efficiency of workers. Mechanical vibrations cause vibrations of the air and are perceived by human hearing organs as sounds. A set of chaotic sounds of different frequency and intensity that cause unpleasant subjective sensations is called noise. The noise intensity is measured in decibels (dB) and the frequency is in Hertz (Hz). Noises vary in volume (in backgrounds) and in height.

The degree of negative impact of noise depends on the strength and frequency of sound, its duration, physical and mental state of the person. The harmful effect of noise is manifested both in the form of specific damage to the hearing organs, and in the form of disorders of many other organs, primarily the central nervous system. Increased duration of work in high noise conditions is accompanied by the progressive development of hearing loss. At the same time there is an auditory adaptation – decrease of auditory sensitivity and fast restoration of hearing after termination of noise. Subsequently, the hearing restoration process is delayed and the hearing analyzer fatigue goes into overweight.

Long-lasting (more than 10 years) noise effects above 90 dB to a person can cause not only hearing loss but also absolute hearing loss. The negative impact of noise on the human nervous system is manifested in headaches, sleeplessness, rapid fatigue, increased sweating, trembling of fingers and hands, increased irritation, memory and attention disorders, and on the cardiovascular system – in pain in the heart, decrease in frequency heart rate, hypotension or hypertension.

The relationship between noise intensity and concentration is shown in Fig. 1.

Disrupting the dynamics of cortical processes and mental functions, noise leads to a deterioration of coordination of movements, reduces working capacity, and productivity of training. Studies of physiologists show that when noise in production facilities is 80-90 dB, people are forced to spend on average 20% more energy to maintain output achieved by them in noise conditions below 75 dB.

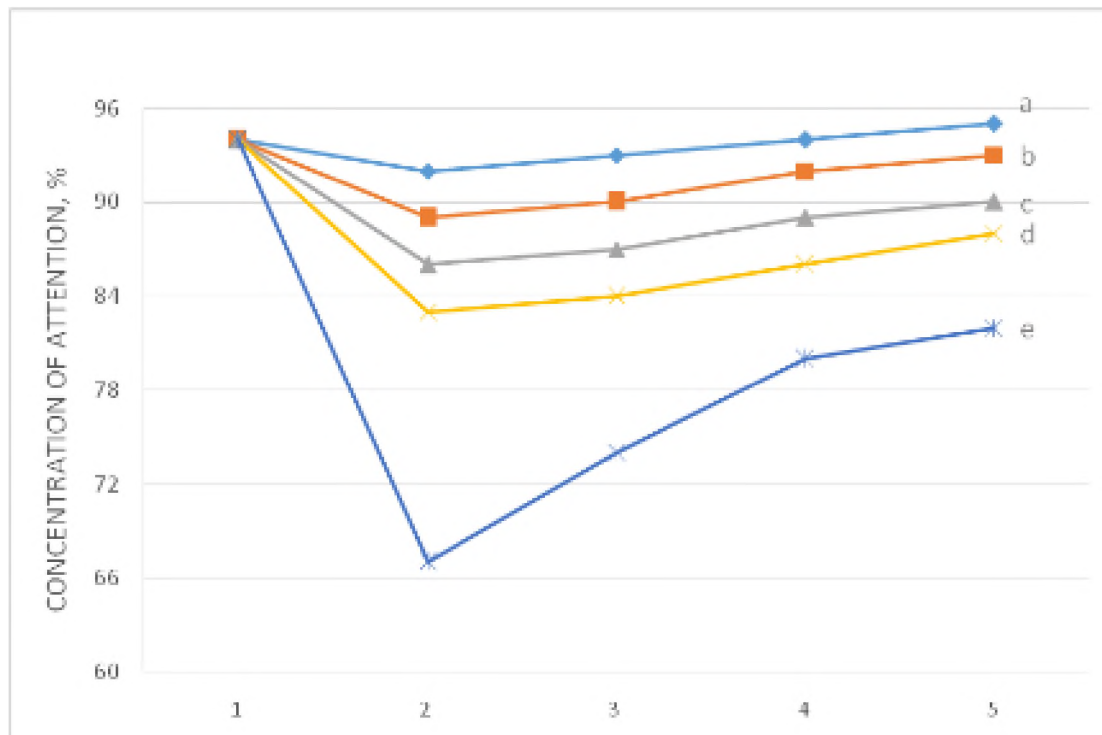


Fig. 1. Effect of noise on attention
 (1 – before noise; 2 – immediately after exposure; 3-5 – after 30, 60 and 120 min after exposure;
 noise intensity: a – 60 dB, b – 70 dB, c – 80 dB, g – 90 dB, d – 100 dB).

It should be noted that, under certain conditions, silence can have a negative impact and reduce labour productivity, since even small sounds attract human attention, distracting from work. Normal background noise increases the level of excitation and has a positive effect on human working capacity. Therefore, when performing many works, it is advisable to stimulate noise in the form of music, which also creates a good mood.

However, a further increase in noise decreases performance, and the noise itself annoys the person, causing his attention to be diminished. In addition, depending on the emotional color, power and intensity of the sound stimulus sounds can be perceived as unpleasant, scary, depressing, restless, tired, stimulating, fun, annoying. Therefore, noise should be avoided at work, which have a negative impact on the mental states of workers, and prevent contact between them [3].

The main directions of noise control are the development and implementation of technical measures that would eliminate the causes of noise generation; removing personnel from high noise levels through the introduction of remote controls; introduction of physiologically sound modes of work and rest; the use of personal protective equipment.

The vibration is another factor affecting the human body. The person deals with the vibration factor during the travelling in transport, working with equipment and in his own premises. The various technical devices and transport can cause vibrations in living apartments and buildings of public use. It is noted that even a small vibration in the room is perceived by the persons a third-party and superfluous factor that negatively affects the physiological and psychological processes of the person, causing anxiety and irritation.

The factors of the production environment that negatively affect the human body include vibration – mechanical vibrations of machines, equipment, tools. Their contacting with the body causes the oscillation of arms, legs, back or body in general. The mechanical vibrations can reach the head, spine and organs of the chest cavity [5]. They are perceived by the receptors of the vibration sensitivity and are transmitted to the central nervous system in the form of nervous impulses.

The prolonged affect of general vibration leads to the changes in the central nervous system that are manifested in dizziness, drowsiness, tinnitus, pain in the calf muscles, impaired movement coordination and visual disturbance. The effect of the vibration on an employee's body is

manifested in the increase of the cost of the nervous energy, the rapid development of fatigue and can lead to the temporary disability because of the vibrational disease. The patient with the vibrating disease has the circulatory disorders, pain in the hands. Sometimes there are convulsions of the hands and decrease of the skin's sensitivity.

Table 2. The limit valid values of the vibration in the workplaces of buildings

Frequency, hertz	Amplitude, millimetre	The speed of oscillation, sm/s	The acceleration of oscillation, sm/s
Up to 3	0,6 – 0,4	1,12 – 0,76	22 – 14
3 – 5	0,4 – 0,15	0,76 – 0,46	14 – 15
5 – 8	0,15 – 0,05	0,46 – 0,25	15 – 13
8 – 15	0,05 – 0,03	0,25 – 0,28	13 – 27
15 – 30	0,03 – 0,009	0,28 – 0,17	27 – 32
30 – 50	0,009 – 0,007	0,17 – 0,23	52 – 70
50 – 75	0,007 – 0,005	0,22 – 0,23	70 – 112
75 – 100	0,005 – 0,003	0,23 – 0,19	

The observance of sanitary norms that regulate limit valid values of the vibration should be obligatory in all institutions. Besides, the effective means of controlling vibration is to improve the design characteristics of machines, mechanisms, tools; implementation of advanced processing methods; remote control; vibration isolation of workplaces; the use of various devices for damping of vibration and individual protection of workers.

It is possible to study the effect of noise on the human with the help of conducting a laboratory experiment. The students were proposed to answer the test tasks. During the performing of these tasks there was a noise of the engine of the driving machine over the dynamic. The effect of noise on human's intellectual and motor functions was tested in this experiment. Besides, during the experiment the loudspeaker from which the music was played vibrated strongly and transmitted vibrations to the desks where the students worked. The vibration and noise distracted the students from the performance of tasks and caused the scattering attention and irritation. Their heart rate was increased to 120-130 beats per minute. This heart rate is observed during the physical activities. 120 subjects participated in this experiment and the results of the experiment were as follows: 75% of participants felt discomfort and palpitations and could not complete the task in time, 15% completed the task, but made a lot of physical and emotional effort, 10% completed the task in time and without much effort and failure of the cardiovascular system. The activity of the students did not have physical activity, so this physiological state of the body was caused by the effect of noise and vibration. It indicates the negative effect of noise and vibration on the human body that can lead to the disease of heart and nervous system, and deterioration of psycho-emotional state and decrease of efficiency. The affect of the environmental factors is the main reason.

The studies of ecology and psychology confirm that the level of the negative effect of the environment and techno sphere on the human body greatly depends on its individual response to the factors of this environment and cause different levels of stress. Depending on how people perceive the stressful situation, researcher M. Chornoushek proposes to divide them into "running horses" and "turtles". "Running horses" come out actively from any situation. They do not take it tragically, have a greater propensity for risk and prefer new. Turtles take everything to heart and therefore suffer more from stress. They postpone important decisions having a hope to avoid stress, not realizing that such behaviour provokes stress.

The villagers and residents of cities have different reactions on the stress caused by the factors that are characterized for large cities. The residents of large cities have learned not to respond to noise, vibration and crowd. On the contrary, the villagers perceive this situation as tragic. But the adaptation to the negative factors should not always be considered as positive because all people that got used to the contaminated and destroyed environment do not want to change anything for better in this environment. The adaptation to the negative factors is considered to be absolutely appropriate only in case if a person can not affect these factors.

So it is important to form the ecological consciousness, ecological installations and ecological behaviour in different age groups, but it is necessary to start from early age. The attitude to the environment can be expressed as a three-component structure that consists of the following components: emotional (emotional), cognitive (cognitive), connective (behavioural).

Conclusions

So in order to determine a person's attitude to the environment it is possible to analyze all three components of that attitude: emotions, cognitive activity directed to the environment and behaviour in the environment. These components have different weight both in individual age and social groups, and in particular features. As a result one of the most important tasks of environmental, engineering and psychological education includes, on the one hand, the formation of all three components and, on the other hand, a harmonious combination of them.

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