



X International Conference on Structural Dynamics, EURODYN 2017

The relationship between psychomotor efficiency and selected personality traits of people exposed to noise and vibration stimuli

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Abstract

Physical factors of an environmental nature are taken into account during testing risks in the workplace of machine operators. The influence of these factors on the human body has both physiological and functional effects. Among the environmental factors vibration and noise are the most frequently observed. The power and scope of impact of noise and vibration stimuli depend largely on individual differences of human. The worth mentioned differences resulting from both the body structure, the specificity of the nervous system and the level of fitness, as well as differences in the psychological sphere.

In this article, the pilot studies with participation of 30 young man are described. The experimental studies were conducted in the laboratory. The importance of certain personality traits and characteristics for perceptual efficiency level under the impact of increased noise and vibration stimuli was tested.

The experimental conditions were based on the theory of H.J. Eysenck, according to which basis of scheme of human action are the inborn properties of the central nervous system, determining the balance between the process of stimulation and inhibition.

During experimental studies, participants were subjected to the influence of local and whole body vibration in the low frequency range. Participants were also subjected to the cumulative effect of these vibrations with noise. They performed the original test used to assess their motor skills, which consists in converting by participants, in the shortest possible time, the movement of cursor along the path displayed on monitor. The number of exits out of the path and the time remaining cursor on the path was registered. The collected data were used to determine the correlation between accuracy in performing actions, physiological parameters and the level of extraversion - introversion as a model of personality of experiment participants under the influence of noise and vibration.

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Peer-review under responsibility of the organizing committee of EURODYN 2017.

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Keywords: Low-frequency vibrations; noise; working efficiency; cognitive psychology; personality.

1. Introduction

Low frequency vibration and noise are specific to the profession of the machine operator. Long-term impact of these physical factors results in specific psychophysiological effects of the operator's body [1, 2]. Few reports of mechanism of vibroacoustic influences on the accuracy of work of the machine operator indicate the need for experimental research in this field. Additionally, the accuracy of the work of people exposure to vibrations or vibrations including noise, may largely depend on the personal characteristics of the operator and his need for stimulation

Individual differences are the subject of many psychologist's research. As a basic component of individual differences can be mentioned personality, which modern definition dates back to the forties of the twentieth century. Eysenck was one of researchers, who proposed a hierarchical approach of personality. His theory rests on the existence of three mutually independent dimensions: Extroversion / Introversion (E) - understood as sociability, vitality, activity, assertiveness and risk-seeking, Neuroticism / Stability (N) - emotionality, which consists of depression, anxiety, low self-esteem, feelings of guilty and Psychoticism / Socialization (P) - the opposite of willingness to control impulses. Component of this dimension is aggression, emotional coldness, self-centeredness, impersonal attitude towards people and impulsivity [3]. What is more important from the point of view of Eysenck research extrovert characterized to the existence of a lower level of cortical arousal than introverts [4]. This would mean, that extroverts should have a higher level of stimulation that would be optimal for them [5], and thus the need for greater stimulation to provoke them [6]. In studies on the positive effects of distractors Von Gehlen and Sachse [7] describe the results of author's experiment, in which the main objective was to demonstrate if activation of cognitive function improves productivity and, if so, whether extroverts extract greater benefit from that kind of activation than introverts.

Results of this study indicate a positive relationship between extraversion and results in a test of attention in a group of cognitive activated. In turn, the research on habits for learning in introverts and extroverts have shown that extroverts prefer during learning a higher noise level than introverts [4, 8]. Doucet and Stelmack [9] in their studies demonstrate that the people with extroverted personality type show a significantly faster time of reflexes than people with introverted type. This is somehow related to the sustain characteristics of this type of personality. In the study dedicated to the relationship between the level of extraversion and executive functions has shown that degree of extraversion has an impact on the efficiency of the tasks. This efficiency depends on the type of executive function [10].

On the accuracy of working of machine operators, except of the vibroacoustic influences, individual characteristics of participant may have significant impact.

Nomenclature

| | |
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| ff | the value of the chair frequency, (Hz) |
| fp | the value of the control panel frequency, (Hz) |
| Af | the value of the chair amplitude, (mm) |
| Ap | the value of the control panel amplitude, (mm) |
| r | correlation coefficient [-] |
| p | probability value [-] |

2. Purpose and methodology of research

The main purpose of this research was to determine, in laboratory conditions, relationship between accuracy of the work and the level of extraversion or introversion as a model of personality during exposure to vibrations and/or noise.

Research participants were 30 young males aged from 21 to 30. All of them were students and after physician examination they were accepted for the experiment. Age restrictions resulted from the fact that twenty years of age is the limit of the end of formation of the central nervous system, and the process of natural aging is characterized by physiological hearing loss.

The effect of selected vibroacoustic factors on work efficiency was not possible using known research tools such

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