

# Psychophysiological and Psychosemantic Aspects of Teaching Stress-resistant Behavior Law Enforcement Officers

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**Abstract.** The relevance of the psychophysiological aspect of stress tolerance in the professional activities of law enforcement officers arises and manifests itself in connection with the high risk of mistakes in non-ordinary situations, as well as in the development of an algorithm for assessing the prognostic psychophysiological parameters of employees.

**Keywords:** psychophysiological aspects, time psychosemantics, professional activity, law enforcement officers, stress, strength of the nervous system, perception of time

## 1 Introduction

The professional activity of a law enforcement officer largely depends on stress resistance and psychophysiological problems.

The development and implementation of psychophysiological diagnostic methods were carried out by leading Russian psychologists N.A. Bernshtein, N.I. Ozeretskiy, A.R. Luriya, B.M. Teplov, V.D. Nebylitsin [2], and foreign authors. For example, S. Baldwin, C. Bennell, J.P. Andersen, T. Semple, and B. Jenkins [6] studied changes in physiological responses under stress; M. Čertický, M. Čertický, P. Sinčák, G. Magyar, J. Vaščák, F. Cavallo [7] have established that psychophysiological reactions can indicate pleasure; K. van Hedger, E.A. Necka, A.K. Barakzai, and G.J. Norman [8] described changes in physiological responses during stress.

## 2 Methods

The sample of law enforcement officers consisted mainly of 155 men (75%), 51 women were examined, 25% of the whole group. In the study, depending on the length of service, 4 groups were identified: under 3 years – 16 people (7.8%), 4-9 years – 38 people (18.4%), 10-20 years – 107 people (51.9%), over 21 years – 45 people (21.9%). The average age was  $35.25 \pm 6.27$ , the average length of service was  $13.80 \pm 6.41$ .

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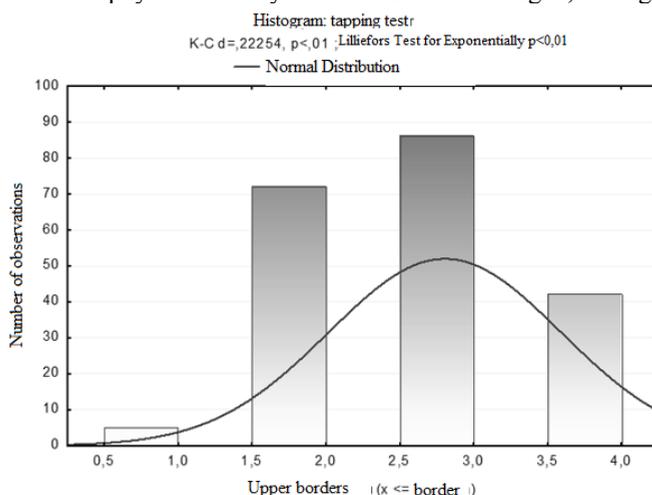
The empirical research methods used: observation, conversation, tests, questionnaires, methods of psychophysiological research. The method complex used to study the psychophysiological and psychosemantic parameters of law enforcement officers included: the method of Semantic Time differential [9](STV), the method of determining a complex sensorimotor reaction (CSMR) [5]; the method of determining the strength of the nervous system (Tapping test), proposed by E.P. Ilyin [11]; the method of determining the reproduction of time intervals – an individual minute [10].

Statistical processing of the research materials was performed using standard statistical procedures. The normal sample distribution was checked according to the Kolmogorov-Smirnov test ( $p \geq 0.05$ ).

### 3 Results and discussion

Candidate selection for law enforcement agencies also implies selection based on certain psychophysiological characteristics, which imply candidates having certain endurance and stress resistance. The authors conducted a study of the psychophysiological characteristics of 206 law enforcement officers.

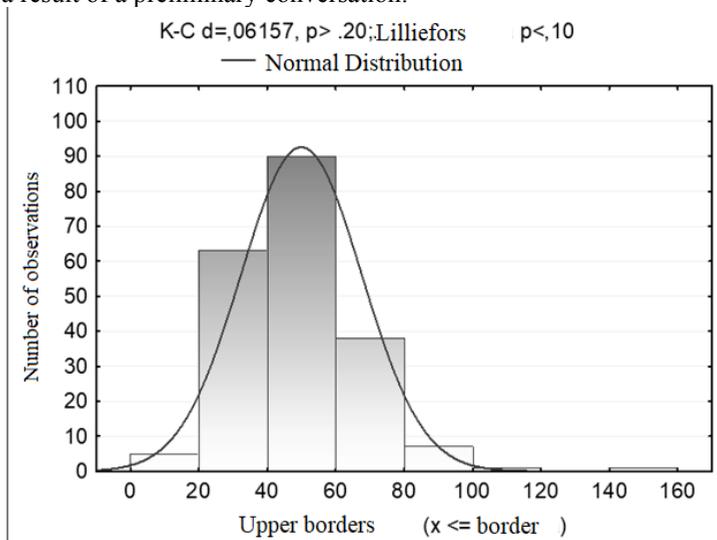
One of the studied psychophysiological characteristics that determine stress resistance is the strength of the nervous system measurement using the Tapping test (Figure 1). It was revealed that the majority of employees have type 2 and type nervous system 3, i.e., the medium-strong and medium-weak type of the nervous system according to E.P. Ilyin [11] ( $M = 2.80$   $SD = 0.79$ ). 42 individuals (20%) with a weak nervous system type were identified, and it can be assumed that these people perform monotonous work, of which there's an abundance in various structures of law enforcement agencies today. The presence of medium-strong and medium-weak of nervous system types shows sufficiently high strength and duration of mental and physical activity that does not cause fatigue, i.e. high stress resistance.



**Fig. 1.** The nervous system type according to the results of the Tapping test 0.5-1 – strong, 1.5-2 – medium, 2.5-3 – medium-weak, 3.5-4 – a weak type of nervous system according to E.P. Ilyin [11].

Thus, with the help of the tapping test, it is possible to assume the possibility of error-free, accurate, and timely execution of certain actions within the required time frame and under certain conditions. The nervous system strength is a predictive indicator of stress resistance.

Another psychophysiological characteristic of stress resistance is the individual minute which characterizes the sense of time, correlates with changes in somatovegetative indicators, and therefore can be used to assess the adaptability of the human body. This technique also reflects the psychophysiological state of the individual. According to the study of an individual minute, anxiety is noted (Figure 2), which is most likely associated with the conduct of the study and unusual nature of the situation ( $M= 49.92$   $SD= 17.74$ ), which was revealed as a result of a preliminary conversation.



**Fig. 2.** Distribution of individual minute indicators.

An individual minute is considered an indicator of time perception. The smaller the individual minute, the faster time flows for a person. Probably, in our case, law enforcement officers finding themselves in an unusual environment (a psychophysiological laboratory) in a situation of uncertainty (the methods were selected in such a way that the subjects saw and performed them for the first time), assessed the research situation as alarming, which suggests an adequate attitude to the study and the reliability of the data obtained. Also, this characteristic refers to dynamic indicators of stress resistance and refers to the indicators trained, the bigger is the number of diverse situations employees find themselves in, and it does not matter whether or not they are natural or artificial, the smaller number of situations will cause uncertainty. Training “internal time”, with the help of an individual minute technique, contributes to the structuring of time and increases stress resistance.

Thus, this is one of the psychophysiological indicators of stress resistance, rapid diagnostics, which takes minimal time. One can consider using the individual minute method for identifying adaptability to stress and the psychoemotional state of the individual.

Individual features of live perception in the aspects of time, i.e., a psychosemantic indicator, are interrelated with psychophysiological factors that affect stress tolerance in professional activity. To study the psychosemantic aspects of time authors used the Semantic Time Differential method [1] (Table 1), which generally showed that law enforcement officers positively assess the present, they do not see significant problems in the past and do not assume they would appear in the future. The low indicator (in comparison with the rest) of time activity characterizes law enforcement officers from the point of view of the “fullness” of internal life and shows that they subjectively have enough time for all planned events and, in this regard, they don't suffer from irritation or annoyance. Table 1 shows that there are no experimental group values, below the values of the norm. The indicator associated with the affective component of psychological time shows the highest value. This

indicator is associated with satisfaction with the existing situation, the predominance of optimistic, positive emotions and feelings, is also characteristic of the past and is planned for the future.

**Table 1.** Scale values of the Semantic time differential method.

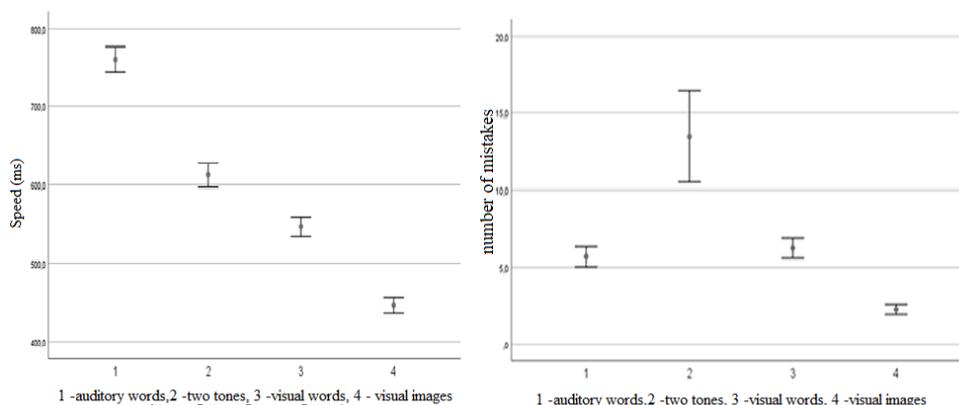
Indicators of the methodology scales		Average experimental values (M± SD)	Average values of the norm*
Time activity	present	4.34± 2.793	5.49± 4.54
	past	4.71± 2.844	3.81± 5.01
	future	4.67± 2.934	5.05± 3.24
The emotional coloring of time	present	10.50± 3.671	2.08± 5.38
	past	10.58± 3.523	1.59± 6.21
	future	11.34± 3.450	5.45± 4.60
Time value	present	7.62± 3.420	2.92± 4.24
	past	8.54± 3.229	1.48± 5.35
	future	10.71± 3.328	5.40± 4.45
Time structure	present	8.37± 3.839	2.14± 3.56
	past	7.09± 4.029	-0.02± 3.95
	future	8.94± 3.913	2.34± 3.64
Perceptibility of time	present	6.38± 5.083	4.65± 4.50
	past	5.13± 4.172	1.49± 5.75
	future	5.83± 3.957	5.10± 4.57

\* Semantic time differential: an expert psychodiagnostic system in medical psychology. Handbook for doctors and medical psychologists [4]

It is possible to note insignificant differences between the present, past, and future of each of the methodology indicators ( $p \geq 0.05$ ), which indicates the predominance of positively colored memories, current situations, and views on the future. Such an attitude to lifetime intervals is possible with the good physical condition and mental well-being, and with high-stress resistance. Psychological characteristics, body structure, and physical well-being are included in the concept of psychophysiological characteristics of a person, and, in turn, psychophysiological characteristics can serve as indicators of stress resistance of law enforcement officers when performing professional activities. Thus, the data obtained using the Semantic Time Differential technique can serve as a basis for further research and comparison of psychophysiological and psychosemantic indicators of stress resistance.

An indicator of stress resistance [3] can be represented by complex sensorimotor reactions [11] or choice reactions, which involve differentiated responses to visual and sound stimuli. These reactions depend on the psychoemotional state of the individual. The psychoemotional state correlates with psychophysiological indicators and stress resistance. Consequently, sensorimotor reaction data can be considered as psychophysiological indicators of law enforcement officers' stress resistance.

In the study of stress resistance, using a single-factor variance analysis of complex sensorimotor response (Figure 3), when comparing the response time to auditory words, comparing two musical tones (higher-lower), visual words, and visual images, the reaction to visual images was the fastest ( $M = 445.77$  ms  $SD = 72.47$ ), the reaction to auditory words among employees was the slowest ( $M = 760.53$  ms  $SD = 115.05$ ). It can be concluded that law enforcement officers react most quickly to various situations that they see, because the faster they take any action, the fewer consequences there will be. They know how to behave in various situations that they see, but at the same time, they take longer to orient themselves after hearing oral instructions.



**Fig. 3.** Speed (ms) and number of mistakes when performing complex sensorimotor responses and to auditory words (1), two tones (2), visual words (3), and visual images (4).

A greater number of mistakes and a large data spread ( $M= 13.49$   $SD= 21.42$ ;  $m=1.51$ ) were made when performing the task to distinguish musical tones (higher-lower), therefore, it can be assumed that there is no professional need for law enforcement officers to distinguish tones, and this characteristic is not a diagnostically important psychophysiological indicator of law enforcement officers' resistance to stress. It is much more important to understand the message in the sound, the meaning of voice messages and the need to respond to them (Figure 3). The least mistakes were made when responding to visual images ( $M=2.21$   $SD=2.31$ ;  $m=0.16$ ), which shows that law enforcement officers almost accurately perceive the events they see.

Based on the results of a complex sensorimotor reaction that demonstrates psychophysiological characteristics directly related to the professional activities of law enforcement officers, we can say that these employees react much faster to situations that they see while making fewer mistakes as well. Therefore, a quick and unmistakable reaction to visual images is one of the psychophysiological features of law enforcement officers. Subjects respond significantly slower to audio stimuli than to visual stimuli and make more mistakes.

Indicators of a complex sensorimotor reaction characterize the strength of nervous processes and the functional state of cortical processes of inhibition and excitation. The higher the response success rate – which consists of the response time, the number of false clicks, and the number of skips – the higher the stress resistance and reliability of the central nervous system. Errors indicate inattention, and false incorrect reactions indicate impulsivity or a decrease in reliability parameters. These indicators also refer to stress resistance dynamic indicators and are subject to training.

## 4 Conclusion

As a result of our research, we can identify certain psychophysiological and psychosemantic indicators of stress resistance in the professional activities of law enforcement officers, to which we attributed:

1. the nervous system resilience, determined by the Tapping test – stress resistance provides a medium-weak and medium-strong type of nervous system;
2. the ratio of the excitation-inhibition processes of the human nervous system, determined by the Individual minute – stress resistance provides small deviations from a given interval;

3. the duration of psychological time, determined by the Semantic time differential method [4] – stress resistance is provided by a positive attitude to all of the time intervals and optimism;

4. indicators of the strength of neural processes and the functional state of cortical processes of inhibition and excitation determined by the Complex sensorimotor reaction method [5] – stress resistance is provided by the reaction speed and a small number of errors in the perception of visual images.

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